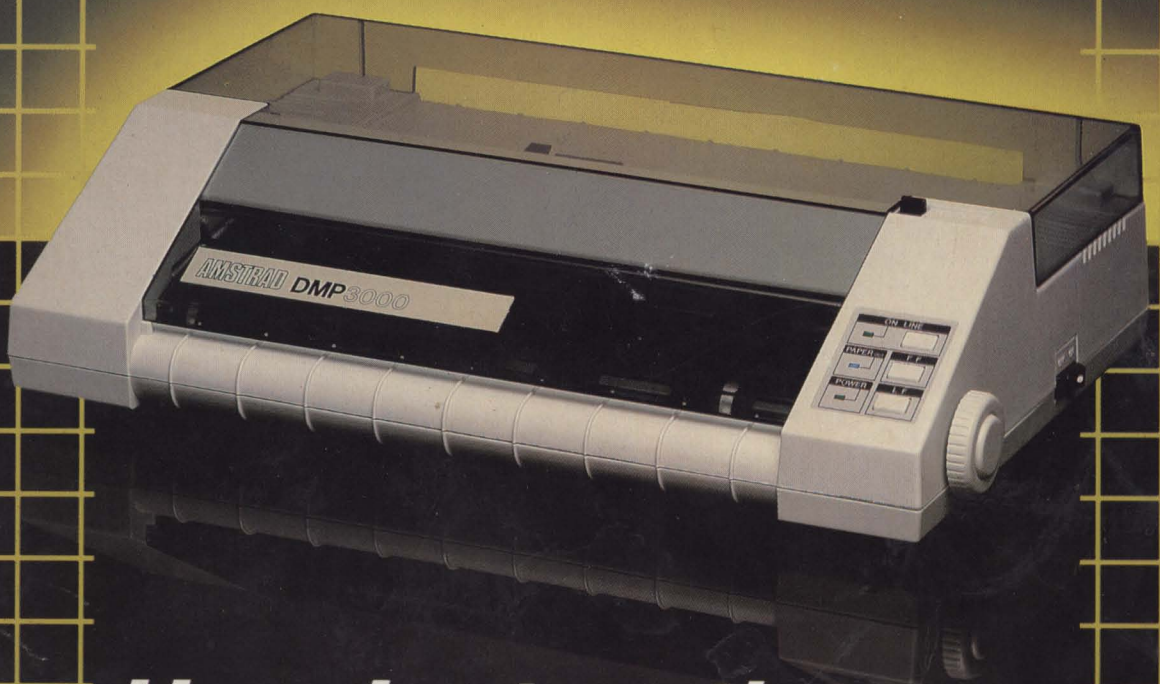
AMSTRAD

DMP 3000/3160/3250DI
PC Compatible
Dot Matrix Printer



User Instructions

PREFACE
TO THE AMSTRAD DMP3000/3160/3250DI
USER INSTRUCTIONS

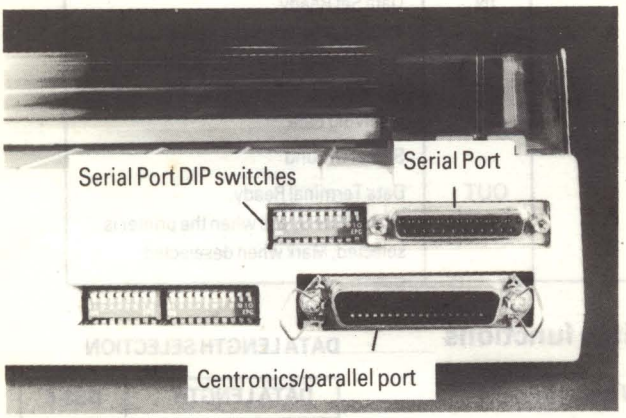
ADDITIONAL INFORMATION FOR DMP3250DI USERS

Your DMP3250DI has two interfaces; a Centronics/parallel port and a serial (RS232C compatible) port. The DMP3000/3160/3250DI User Instructions book contains details of the Centronics/parallel port, the RS232C serial port is described below.

IMPORTANT NOTICE

Where a printer cable has been supplied with your DMP3250DI it is for Centronics/parallel connection ONLY

A serial printer lead is not supplied



PRINTER LEAD - SERIAL

You will require an RS232 Null-modem cable with a 25-pin D-type male connector for the printer on one end and a connector on the other end for the serial port of your computer, consult your dealer if you do not already have a suitable lead.

CONNECTING THE PRINTER TO A PC - SERIAL INTERFACE

Before connecting the serial lead make sure your computer and printer are switched OFF.

When you have connected the printer set the Serial Port DIP switches on the back of the printer (see over page for settings, DS3-8 and DS3-9 would normally be set for Ready/Busy protocol) then turn your printer and computer on.

Set your computer so that the printer output is sent to the serial port and the baud rate, parity, data length and stop bit agree with the DIP switch settings. If you do not know how to do this you will need to refer to your computer manuals. If you are using an Amstrad PC you will need to refer to the following sections of your User Instructions book:

Appendix V1.2 "Making use of the Serial Interface"
Part III 7.1 "Sending printer output to the Serial Interface"
Part III 7.3 "MODE"

Serial Interface

PIN	DESIGNATION	I/O	DESCRIPTION
1	FG	--	Frame Ground
2	SD	OUT	Send data This is a signal line to transmit serial data from the printer. This will be Mark when there is no data to transmit.
3	RD	IN	Receive Data This is a signal line to transmit serial data to the printer. This must be Mark when there is no data to transmit.
4	RTS	OUT	Request To Send This will be Space when data can be received, Mark when data cannot be received.
5	CTS	IN	Clear To Send This must normally be Space to allow the printer to send data. If this line is Mark status, no data will be transmitted from the printer.
6	DSR	IN	Data Set Ready This must be normally Space to allow the printer to receive data. If this line is Mark status, the printer will ignore the receiving data.
7	SG	--	Signal Ground
20	DTR	OUT	Data Terminal Ready. This will be Space when the printer is selected, Mark when deselected.

Note

"Space" level is + 12v
"Mark" level is – 12v

Serial Port DIP switch functions

BAUD RATE SELECTION (serial I/F only)

BAUD RATE	DS3-1	DS3-2	DS3-3
9600 bps	ON	ON	ON
4800 bps	OFF	ON	ON
2400 bps	ON	OFF	ON
1200 bps	OFF	OFF	ON
600 bps	ON	ON	OFF
300 bps	OFF	ON	OFF
200 bps	ON	OFF	OFF
150 bps	OFF	OFF	OFF

PARITY SELECTION

PARITY	DS3-4
YES	OFF
NO	ON
	DS3-5
ODD	OFF
EVEN	ON

The Default setting of all Serial Port DIP switches is OFF.

DATA LENGTH SELECTION

DATA LENGTH	DS3-6
8 bit	ON
7 bit	OFF

STOP BIT

STOP BIT	DS3-7
1 bit	OFF
2 bit	ON

PROTOCOL SELECTION

PROTOCOL	DS3-8	DS3-9
Serial(XON/XOFF)	ON	OFF
RTS (Ready/Busy)	OFF	OFF
Serial (ETX/ACK)	OFF	ON

INTERFACE SELECTION

INTERFACE	DS3-10
Centronics/parallel	OFF
Serial	ON

Introduction

AMSTRAD DMP3000/3160
PC Compatible Dot Matrix Printer

The DMP3000/3160 is yet another milestone in the AMSTRAD range of low-cost high-performance computer products.

It combines the versatility of an industry standard software instruction set with AMSTRAD's expertise in quality engineering.

Single cut sheet or continuous paper may be used, and the ingenious 'flatbed' design allows the easy insertion and alignment of both tractor and friction feed paper. Printing speeds of up to 160 characters per second will make rapid work of even the most lengthy drafts.

The extremely wide choice of sizes and typefaces coupled with a complete ASCII, international and graphics character set should provide a solution to any printing problem. In addition, the implementation of dot addressable graphics and standard Epson compatible command codes will allow the DMP3000/3160 to operate directly with most software, including word processors, spreadsheets and graphics programs.

The DMP3000/3160 will operate with the AMSTRAD PC or any other IBM PC-compatible which incorporates a standard parallel printer interface.

The DMP3000/3160 will also operate with any other personal or home computer (for example the AMSTRAD CPC series or the Acorn range of BBC microcomputers) which provide standard parallel printer output. In addition, the printer may be used (via a suitable interface) with computers which provide serial printer output (for example the Commodore or Sinclair ZX Spectrum range of computers).

NOTE - THROUGHOUT THIS MANUAL, ALL REFERENCES TO MODEL DMP3000 ARE EQUALLY APPLICABLE TO MODEL DMP3160 (EXCEPT WHERE OTHERWISE STATED).

AMSTRAD

© Copyright 1986 - AMSTRAD Plc.

Neither the whole nor any part of the information contained herein, nor the product described in this manual, may be adapted or reproduced in any material form except with the prior written approval of AMSTRAD Plc. ('AMSTRAD').

The product described in this manual, and products for use with it are subject to continuous development and improvement. All information of a technical nature and particulars of the product and its use (including the information and particulars in this manual) are given by AMSTRAD in good faith.

All maintenance and service on the product must be carried out by AMSTRAD authorised dealers. AMSTRAD cannot accept any liability whatsoever for any loss or damage caused by service or maintenance by unauthorised personnel. This guide is intended only to assist the reader in the use of the product, and therefore, AMSTRAD shall not be liable for any loss or damage whatsoever arising from the use of any information or particulars in, or any error or omission in, this guide or any incorrect use of the product.
We ask that all users take care to submit their user registration/guarantee cards.

All correspondence relating to the product or to this manual should be addressed to:

AMSTRAD Plc.
Brentwood House
169 Kings Road
BRENTWOOD
Essex CM14 4EF

IBM, IBM PC, IBM BASIC, and DOS are trademarks of International Business Machines Inc.
MS-DOS and Microsoft BASIC are trademarks of Microsoft Corporation.
DOS Plus, GEM, and CP/M are trademarks of Digital Research Inc.
Locomotive BASIC 2 is the trademark of Locomotive Software Ltd.

Acknowledgements to Acorn, BBC, CBM, Centronics and Epson.

First Published 1986
Second edition 1987

Written by Ivor Spital

Typeset and published by AMSTRAD

AMSTRAD is a registered trademark of AMSTRAD Plc.
Unauthorised use of the trademark or word AMSTRAD is strictly forbidden.

IMPORTANT

You must read this....

1. Always connect the mains lead of the printer to a 3-pin plug following the instructions in chapter 1.

2. Do not attempt to connect the printer to any mains supply other than 220-240V AC 50Hz.

3. There are no user serviceable parts inside the printer - DO NOT ATTEMPT TO GAIN ACCESS INSIDE THE CASING. Refer all servicing to qualified service personnel.

4. Do not operate the printer with its ribbon removed.

5. Do not operate the printer with no paper loaded.

6. Do not switch on or operate the printer with the cardboard print head stabilisers in position.

7. Do not bring drinks or any other liquids near the printer. If you *do* accidentally spill liquid on the printer, immediately remove the mains plug from the supply socket and consult your dealer.

8. Do not block or cover the ventilation slots in the cabinet.

9. Do not use or store the printer in excessively hot, cold, damp, or dusty areas.

Contents

Chapter 1
Open the box....

How to wire up the mains plug
Preparing the printer
Fitting the ink ribbon
Connecting the printer to your computer
Loading the paper
How the controls work
First steps in printing

Chapter 2
Simple printing exercises....

Printing and listing in BASIC
Notation used in this manual
Printing DOS files
Wildcards
Listing the disk directory to the printer
Echoing screen output to the printer
Printing a screen dump
Printing GEM files
Printing DOS Plus and CP/M files
The print buffer
Default character set
The DIP switches
How to print international characters
How to change to an alternative typeface
Control codes

Chapter 3
Selecting print styles....

Choice of styles
Cancelling your choice
Combined styles
Illegal combinations

Chapter 4
Print formatting control....

Print head movement
Form feed
Margin setting
Page length setting
Perforation skipping
Tabulation
Paper feed rate adjustment

Chapter 5
Graphics printing....

Introduction
Single, double, and quadruple density graphics
Bit image graphics modes

Chapter 6
Extra functions....

Incremental print
Printable code area expansion
Eighth bit setting
Control code printing
Reset, paper out, bell, and delete
Print head control
Character table selection
International character sets
Print mode selection
User defined characters
Hexadecimal dump

Chapter 7
For your reference....

Technical Specification
Printer socket
Interface
DIP switch functions
Signal timing

Appendix 1
Table of control codes

Appendix 2
Character tables

Appendix 3
Index

Chapter 1
Open the box....

Subjects covered in this chapter:

- How to wire up the mains plug
- Preparing the printer
- Fitting the ink ribbon
- Connecting the printer to your computer
- Loading the paper
- How the controls work
- First steps in printing

Unpacking your printer

In addition to the DMP3000 printer and this manual, you will also find a small box within the packing pieces containing the ink ribbon, as well as the paper guide bar. Make sure that you do not accidentally discard either of these items during unpacking.

Fitting a mains plug to your printer

The DMP3000 operates from a 220-240 Volt AC 50Hz mains supply. Fit a proper mains plug to the mains lead of the DMP3000. If a 13 Amp (BS1363) plug is used, a 3 Amp fuse must be fitted. The 13 Amp fuse supplied in a new plug must NOT be used. If any other type of plug is used, a 5 Amp fuse must be fitted either in the plug or adaptor or at the distribution board.

WARNING: THIS APPARATUS MUST BE EARTHED

IMPORTANT: The wires in this mains lead are coloured in accordance with the following code:

Green-and-yellow	**: Earth**
Blue	**: Neutral**
Brown	**: Live**

As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows:

The wire which is coloured **GREEN-AND-YELLOW** must be connected to the terminal in the plug which is marked by the letter **E** or by the safety earth symbol ⏚ or coloured green or green-and-yellow.

The wire which is coloured **BLUE** must be connected to the terminal which is marked with the letter **N** or coloured black.

The wire which is coloured **BROWN** must be connected to the terminal which is marked with the letter **L** or coloured red.

Disconnect the mains plug from the supply socket when not in use.

Do not attempt to remove any screws, nor open the casing of the DMP3000. Always obey the warning on the rating label located on the underside of the unit:

WARNING:
LIVE PARTS INSIDE - DO NOT REMOVE ANY SCREWS

WARNING-
DO NOT CONNECT TO "I T" POWER SYSTEM

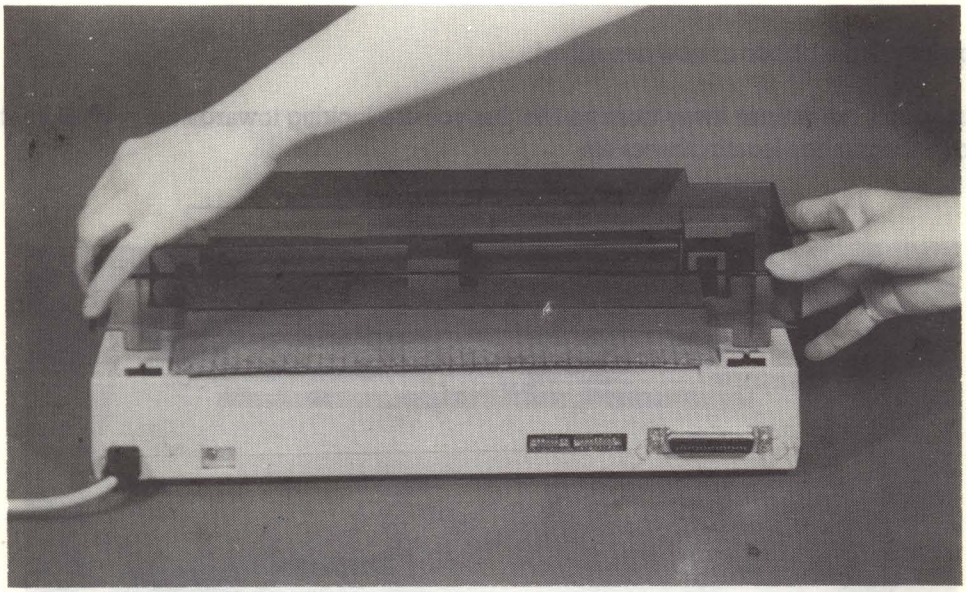
Note: An "I T" power system is a power distribution system having no direct connection to earth, the exposed conductive parts of the electrical installation being earthed.

Preparing your printer

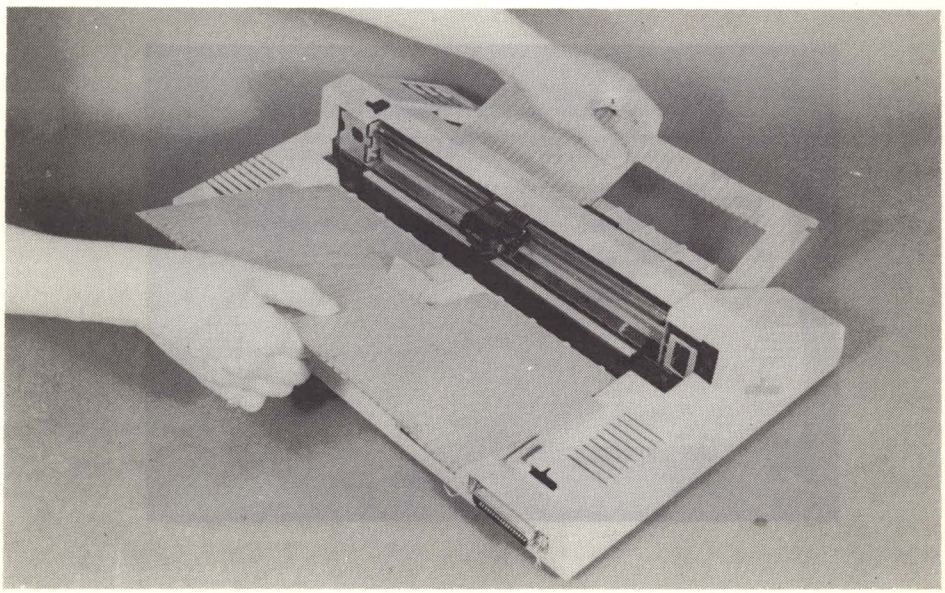
Now that you've fitted the mains plug, you'll no doubt be anxious to switch on and start printing.... DON'T! There are a number of important preparations yet to be made, and it is vital that you carry out the following instructions first:

Removing the cardboard print head stabilisers

Firstly, remove the clear plastic cover at the top of the printer by simply lifting it off. To replace the cover, simply lower the locating flaps at the rear of the cover into the holes above the rear edge of the printer (see the picture at the top of the next page). When the printer cover is in position, it may be hinged to either an open or closed position.



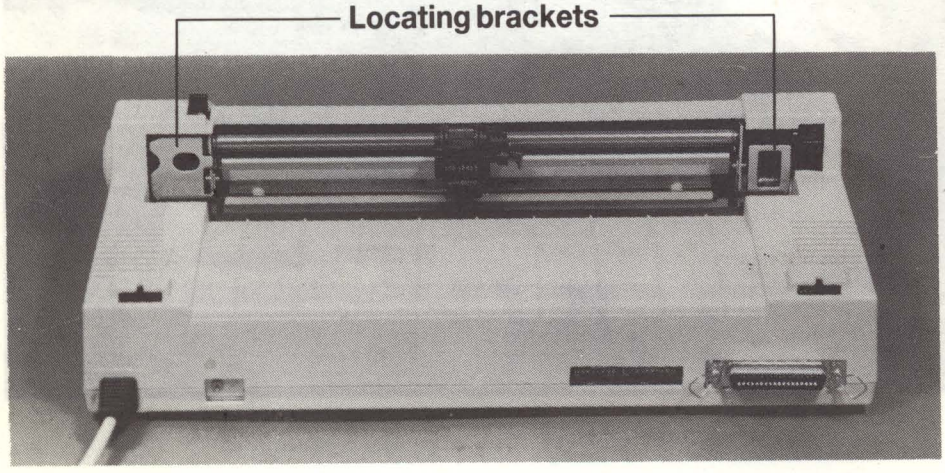
Now remove the cardboard print head stabilisers by sliding them out of the printer.



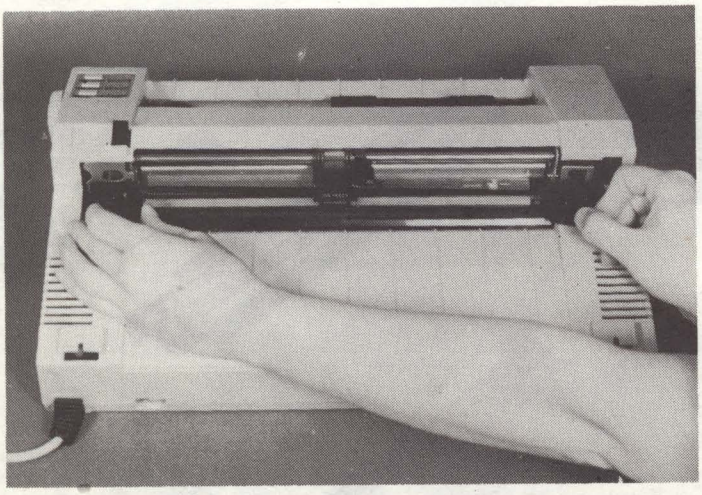
Fitting the ribbon

Carefully fit the ribbon as now described.

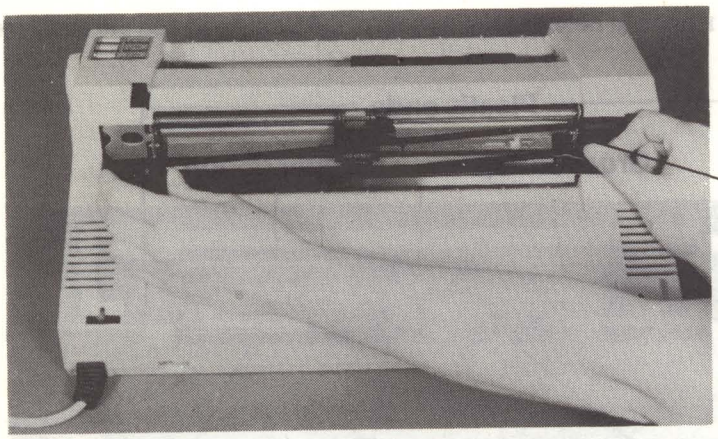
Firstly, turn the printer away from you so that you are looking towards the rear. Note the two (metal) ribbon locating brackets.



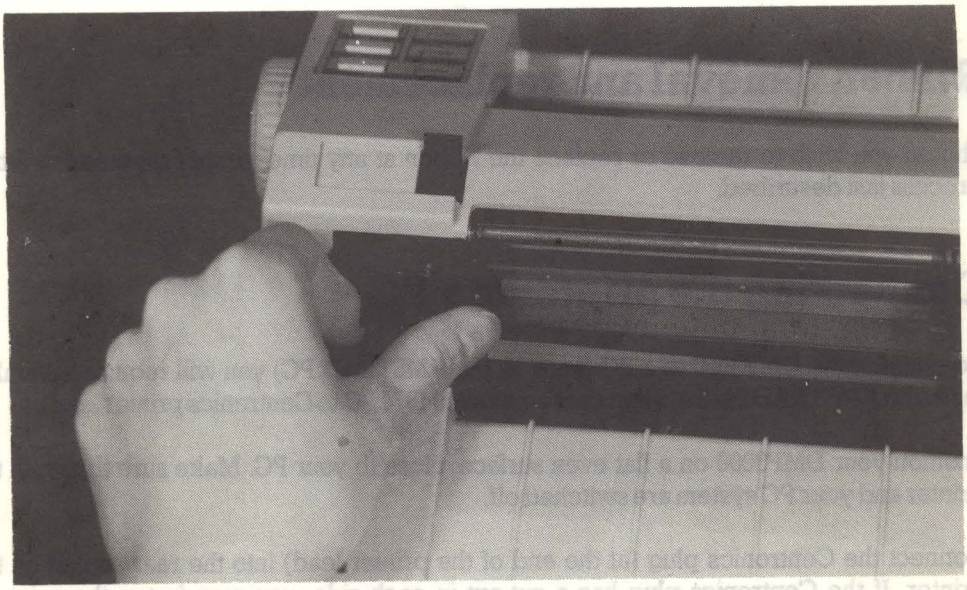
Carefully remove the ribbon from its packing, and prepare to fit the two plastic ends of the ribbon assembly into the metal locating brackets on the printer.



Start by fitting the plastic end which is in your right hand. Place the bottom of the plastic end into the square hole in the locating bracket. Now clip the top of the plastic end fully into position.



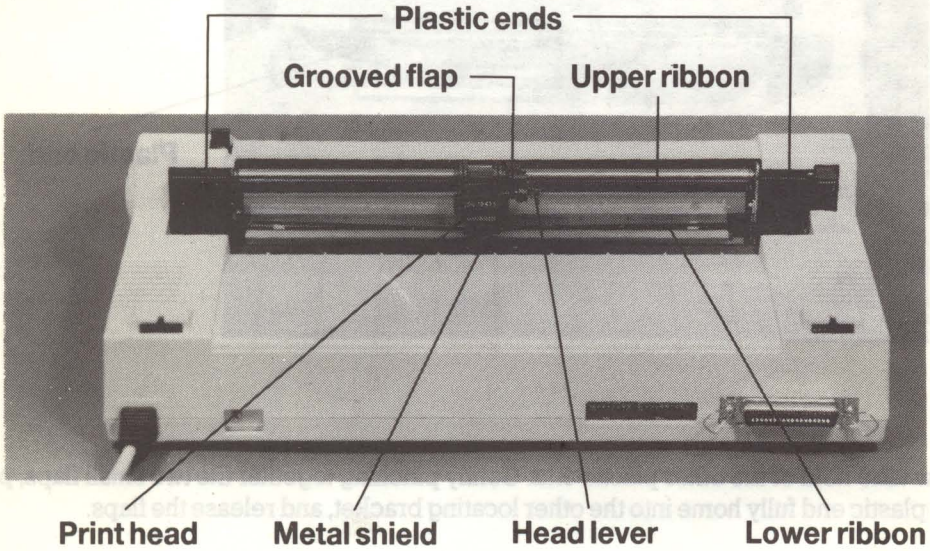
Now take hold of the other plastic end. Gently pinching together the two small flaps, place the plastic end fully home into the other locating bracket, and release the flaps.



Both plastic ends should now be locked fully into place.

The ribbon which runs between the plastic ends must now be correctly positioned. Gently raise the small head lever to the right of the print head, then slide the upper ribbon under the grooved flap above. Now release the head lever.

Finally, slide the lower ribbon in between the bottom of the print head and the small metal shield below.



Ribbon removal and replacement

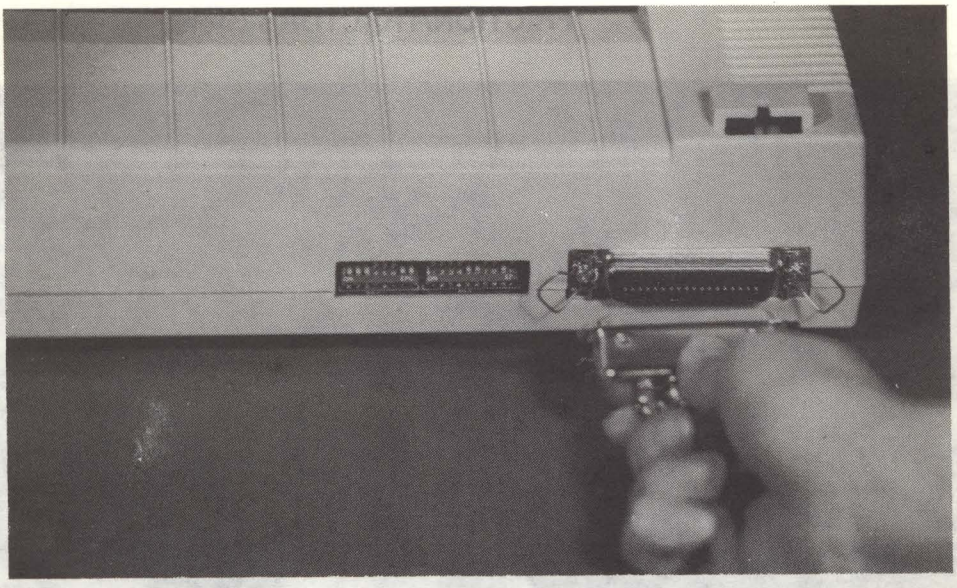
Should you wish to remove or replace the ribbon at any time, simply reverse the fitting process just described.

Connecting the printer to a PC

To connect the DMP3000 to a PC (such as the AMSTRAD PC) you will require a suitable lead (the AMSTRAD PL-2 or any other equivalent IBM PC to Centronics printer lead).

Position your DMP3000 on a flat even surface, close to your PC. Make sure that both the printer and your PC system are switched off.

Connect the Centronics plug (at the end of the printer lead) into the rear socket on the printer. If the Centronics plug has a cut-out in each side, you may fasten the printer's locking-clips into the cut-outs.



Connect the other end of the printer lead into your PC. If you are connecting the DMP3000 to an AMSTRAD PC, use the socket marked PARALLEL PRINTER at the rear of the PC system unit.

You may now replace the printer cover and turn the printer towards you.

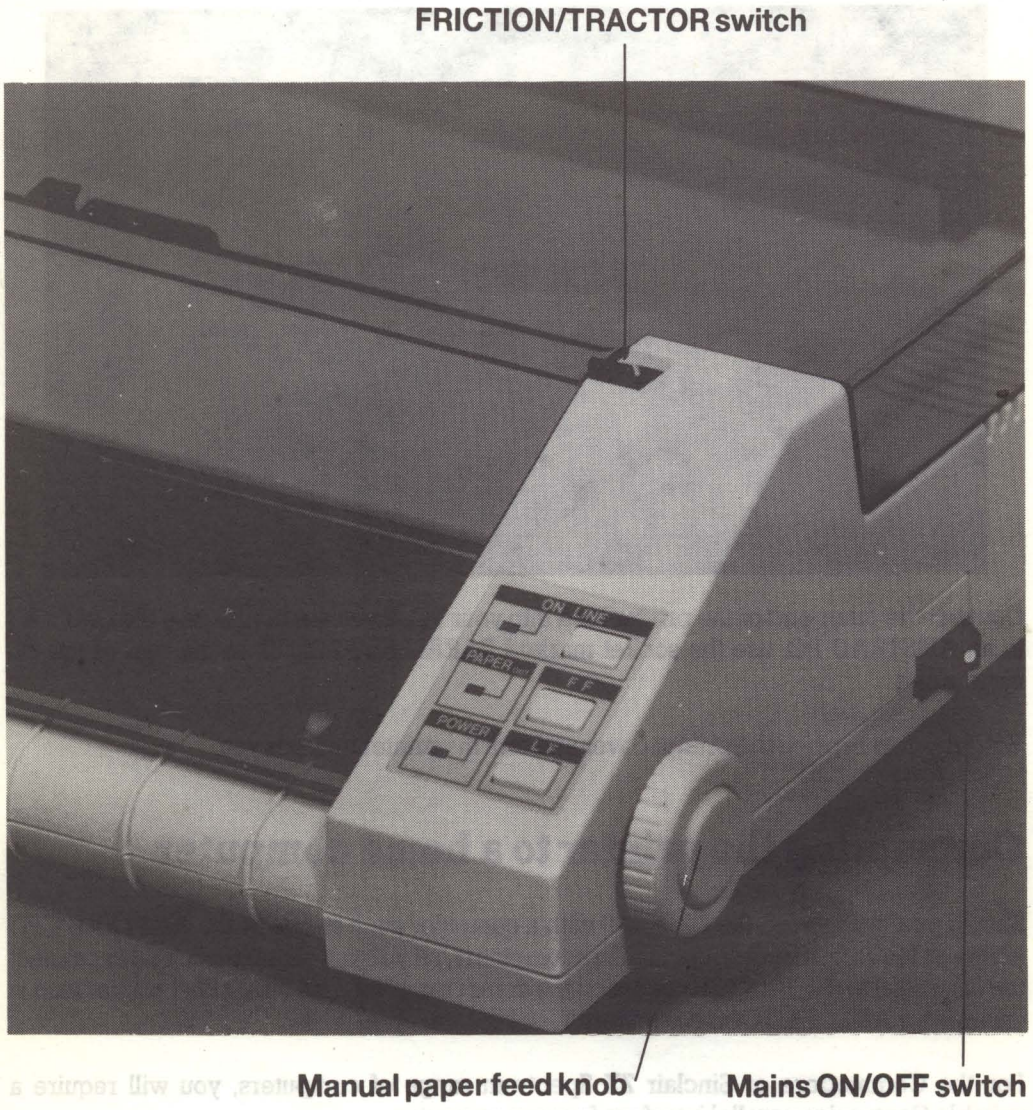
Connecting the printer to a home computer

Should you wish to use the DMP3000 with a computer such as one of the AMSTRAD CPC series or the Acorn BBC range of microcomputers, all you will require is a lead to connect the DMP3000 to the PRINTER socket on the computer. (The AMSTRAD PL-1 printer lead is suitable for AMSTRAD CPC computers.)

For the Commodore or Sinclair ZX Spectrum range of computers, you will require a suitable Centronics parallel interface for your computer.

Getting to know your printer

Take a good look at your printer. You'll be switching it on very shortly now, and it's as well to get acquainted with the names of all the buttons, knobs, switches, and lamps beforehand.



Switching on

Switch on your computer system, then set the DMP3000 mains ON/OFF switch (at the right hand side of the printer) to *on*. The print head will move about for a few seconds, and you will then hear a bleeping sound. This sound is the paper out alarm, but do not worry about it for the moment. After the alarm has stopped, you will note that the POWER lamp and the PAPER OUT lamp are both on.

All that remains to do now is load the paper, then you can start printing.

Loading the paper

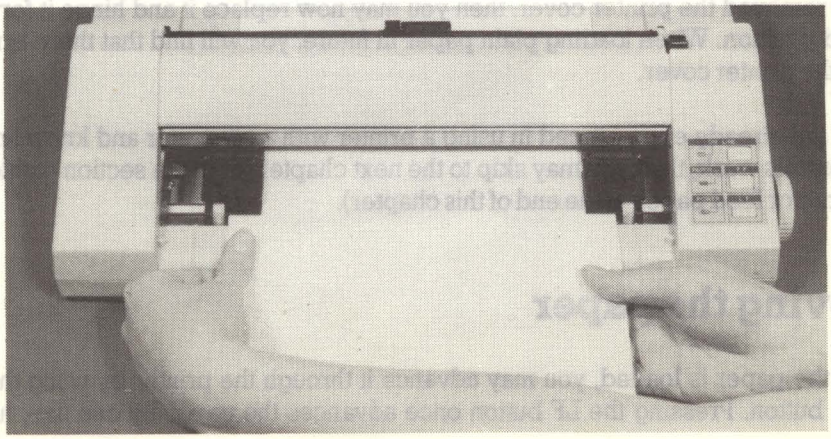
Hinge back the printer cover to its open position or remove it altogether. Look inside the paper compartment, and you will see 4 sliding plastic blocks attached to a metal bar.

The two outer plastic blocks are called tractors, and they may be moved left or right to accommodate the size of paper you are using. The two inner plastic blocks support the middle of the paper and may be slid to any suitable position.

The DMP3000 may be used with plain paper or tractor feed paper (fan fold paper with holes at the side). There is a section entitled 'How to load tractor feed paper' at the end of this chapter.

How to load plain paper

Set the FRICTION/TRACTOR switch to TRACTOR. Take a piece of plain paper (A4 or similar) and slide it into the lower slots on the tractors:

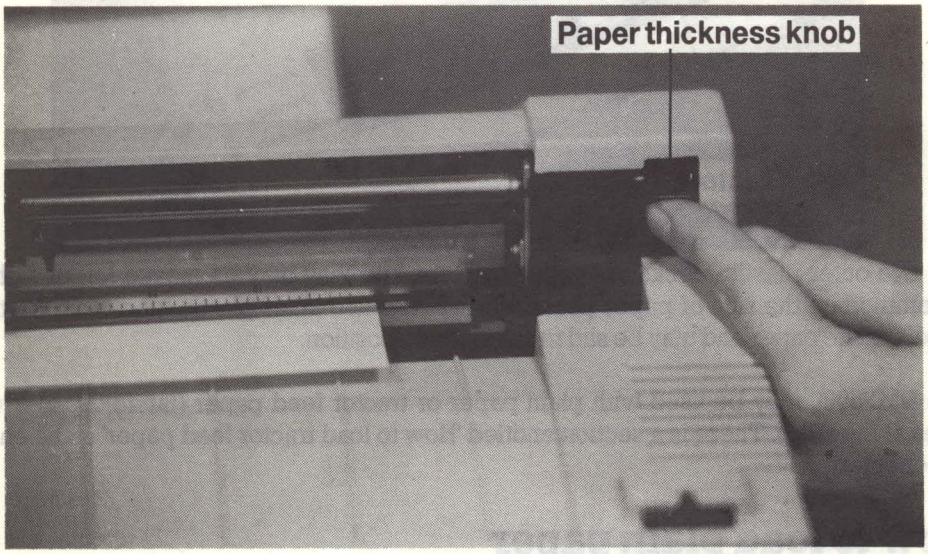


You will see the paper coming through, out of the top of the printer (just underneath the print head). Straighten up the position of the paper by hand, then set the FRICTION/TRACTOR switch to FRICTION. The paper is then loaded.

(Note that the position printing takes place on the paper, is directly under the print head.)

Paper thickness adjustment

Once the paper is loaded, you may adjust the paper thickness knob to a suitable setting - upwards for thicker paper (or two sheets); downwards for thinner paper.



Note that moving the paper thickness knob downwards will darken the printing; moving it upwards will lighten the printing.

If you removed the printer cover, then you may now replace it and hinge it forward to its closed position. When loading plain paper in future, you will find that there is no need to open the printer cover.

If you are already experienced in using a printer with a computer and know how each of the controls work, then you may skip to the next chapter (or to the section entitled 'How to load tractor feed paper' at the end of this chapter).

Moving the paper

Once the paper is loaded, you may advance it through the printer by using the LF (Line Feed) button. Pressing the LF button once advances the paper by one line; holding the

button down allows you to advance the paper continuously until you release the button. The FF (Form Feed) button will allow you to advance the paper by one page at a time. The use of this button will be explained shortly. Both the LF and FF buttons will only operate when the ON LINE lamp is off.

You may at any time advance the paper by using the manual paper feed knob instead of the LF and FF buttons.

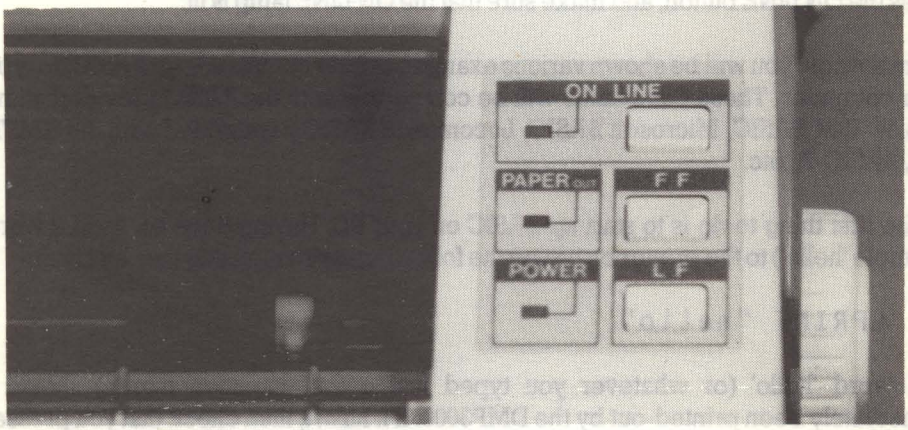
Starting printing

The DMP3000 incorporates a *self test* facility whereby all the ASCII characters are automatically printed. To try this out, first set the mains ON/OFF switch to *off*. Now, holding down the LF button, set the mains ON/OFF switch to *on*. Release the LF button, and self test printing will start and continue until either the paper runs out, or the mains is switched off.

After four or five lines of self test printing, set the mains ON/OFF switch to *off*.

Have a look at what's been printed. If the characters have not been printed clearly and evenly, check that you have installed the ribbon and paper correctly.

Now switch the printer back *on* again. Assuming that you still have some paper loaded in the printer, notice that when you switch on this time, the paper out alarm does NOT come on, and the ON LINE lamp is lit.



What does 'on line' mean?

'On line' means that the printer is ready to print (as soon as it receives a command from the computer). Note that when the printer is on line, you won't be able to move the paper using

the LF or FF buttons. What you must then do is press the ON LINE button once, so that the ON LINE lamp goes off. This is known as setting the printer 'off line', and you will then be able to advance the paper using the LF and FF buttons. So briefly, the rule is: on line to print; off line to stop printing ready to move the paper.

The FF button

The FF button may be used to advance the paper through the printer by one whole page.

To demonstrate, set the printer off line, then press the FF button. Watch what happens to the paper.

Form feed is very useful if, for example, you've just printed a letter to somebody and you wish to run it out from the printer.

If you are using tractor feed paper (explained at the end of this chapter) you may use the FF button to advance the paper by one page's length.

Print your first word

Load a piece of paper into the printer.

Press the ON LINE button, and make sure that the ON LINE lamp is lit.

From now on, you will be shown various example printer commands (in BASIC) to type into your computer. These commands will be compatible with the BASIC provided with most PCs, ie. IBM BASIC, Microsoft BASIC, Locomotive BASIC 2 (provided with the AMSTRAD PC), BASIC-A, etc.

So the first thing to do is to start up BASIC on your PC. Having done so, send a word (for example 'hello') to the printer by typing the following instruction into the computer:

```
LPRINT "hello"
```

The word 'hello' (or whatever you typed inside the quotation marks) should have immediately been printed-out by the DMP3000. If it hasn't, then check that you pressed the [↵] (**[Return]** or **[Enter]**) key on your computer after typing in the instruction. If nothing still was printed, then check that the lead between the printer and the computer is correctly fitted at both ends, that the paper is correctly loaded, and that the printer is on line.

Well, you have now set up the DMP3000 and printed your first word. The next chapter goes on to describe some of the simpler printing functions, and will introduce you to some of the

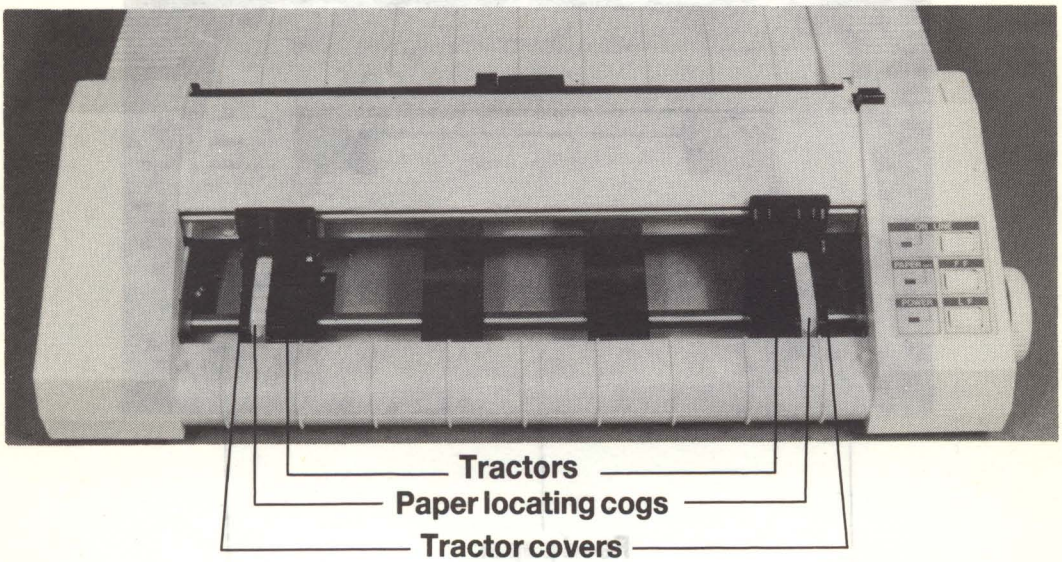
alternative styles of printing that the DMP3000 is capable of.

Finally in this chapter....

How to load tractor feed paper

Tractor feed paper is useful if you want to print program listings or long continuous texts. Load the paper as follows:

Open the printer cover, and hinge back the flaps on top of the tractors (these are known as the tractor covers):

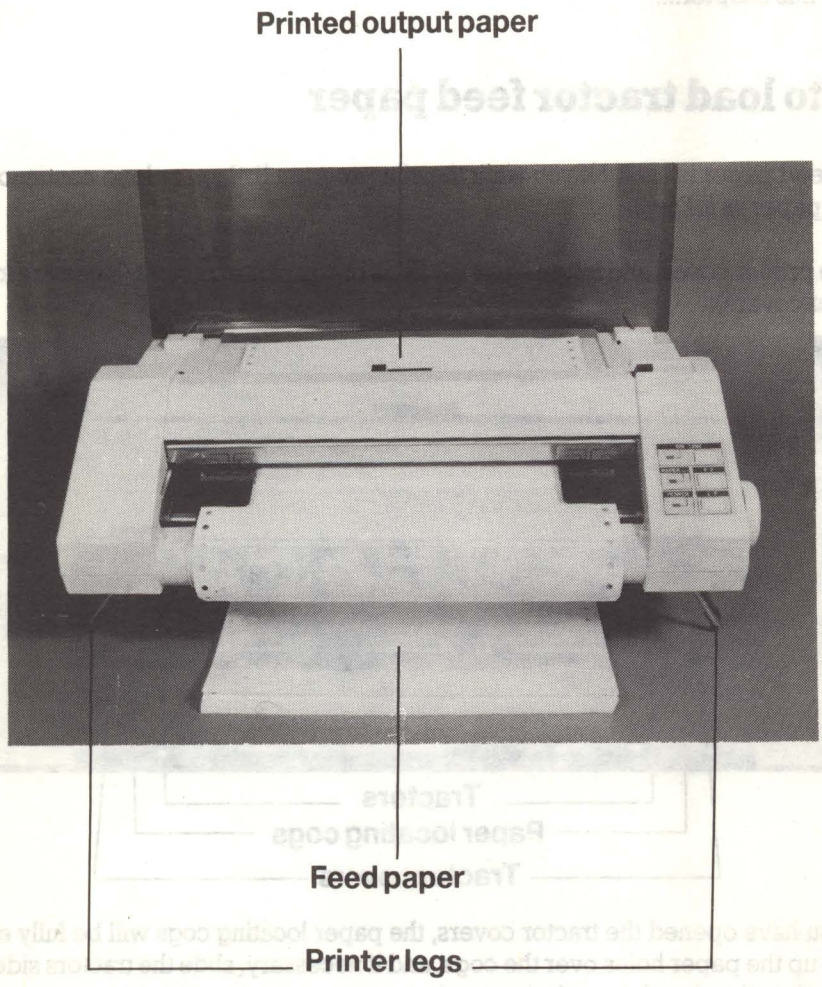


When you have opened the tractor covers, the paper locating cogs will be fully exposed. Now line up the paper holes over the cogs, and if necessary, slide the tractors sideways to accommodate the size of paper being used.

Place the paper over the cogs and close the tractor covers. Set the FRICTION/TRACTOR switch to TRACTOR, and carefully feed the paper into the printer (using the LF button or the manual paper feed knob) making sure that the paper feeds in smoothly without creasing or tearing at the tractors.

When you see the paper coming out of the top of the printer (just underneath the print head) the paper is loaded, and you may then close the printer cover.

If you wish, you may position the feed paper underneath the printer by extending the printer legs (as shown on the next page).



The paper guide bar may optionally be fitted between the left and right front feet of the printer.

Make sure that the printed output paper is allowed to run out freely, and pile directly behind the printer. The paper should fold one way, then the other, as it piles.

Chapter 2
Simple printing exercises....

Subjects covered in this chapter:

- Printing and listing in BASIC
- Notation used in this manual
- Printing DOS files
- Wildcards
- Listing the disk directory to the printer
- Echoing screen output to the printer
- Printing a screen dump
- Printing GEM files
- Printing DOS Plus and CP/M files
- The print buffer
- Default character set
- The DIP switches
- How to print international characters
- How to change to an alternative typeface
- Control codes

Printing in BASIC

Having set up the DMP3000 and printed a word or so, you'll by now have gathered that to send text to the printer, you simply use the BASIC command `LPRINT` followed by the text you wish to print (inside quotes). This not only applies to the printing of constant strings (such as that shown in the previous example), but also to any combination of string variables, numbers, numeric variables, or control codes (more about these later).

Formatted printing may also be executed using the options: `LPRINT TAB`, `LPRINT USING` and `ZONE`.

Consult your BASIC manual about the use of these commands.

Listing a program in BASIC

BASIC programs may be listed to the printer. Simply type in:

```
LLIST
```

(Don't forget to always press the ↵ **([Return]** or **[Enter])** key on your computer after typing in an instruction.)

Alternatively, you may list a specific line (or range of lines).

Example commands (together with their meanings):

```
LLIST 20-50      (list from line 20 to line 50)
LLIST -200       (list from beginning of program to line 200)
LLIST 80-        (list from line 80 to end of program)
```

To list a program to the printer under Locomotive BASIC 2 (supplied with the AMSTRAD PC), use the mouse to pull down the PROGRAM menu, then select the LIST option.

Notation used in this manual

IMPORTANT: Before we go on to showing you some more example commands, you should note that from now on in this manual, an item shown in angled brackets, eg. ‹item› is NOT to be typed-in literally; the item merely represents the *sort* of information to be entered. Hence, where the manual gives an example command:

```
PRINT ‹filename›
```

....you would typically type in:

```
PRINT letter.jim
```

....where 'letter.jim' is the filename.

Furthermore, items shown in square brackets, eg. [‹item›] are optional and need not be entered unless required. Hence, where the manual gives an example command:

```
PRINT [‹drive›:]‹filename›
```

....you may typically type in:

```
PRINT letter.jim      ....or....   PRINT a:letter.jim
```

....where 'letter.jim' is the filename and 'a' is the (optional) drive. The : colon (which is NOT in angled brackets) *must* be typed-in literally if the optional part of the command is used.

NOTE: The next section in this manual deals with printing *non-BASIC* files under the operating systems: MS-DOS, PC-DOS, GEM, DOS Plus and CP/M. If you are only interested in printing from BASIC, then skip to the section ahead entitled 'Back to BASIC'.

Printing DOS files

Under MS-DOS, PC-DOS or DOS Plus, files may be printed-out using the following commands:

```
PRINT [‹drive›:]‹filename›
```

Example command:

```
PRINT a:autoexec.bat
```

....which will print-out the file 'autoexec.bat' (if it is present on the disk currently in Drive A:).

You may then see a prompt on the screen similar to:

```
Name of list device [PRN]:_
```

....whereupon you should press [↵] **([Return]** or **[Enter])**.

Further messages about the operation in progress will appear on the screen, and the specified file will be printed-out by the DMP3000.

Alternatively, you may use the `COPY` command to send the file to the printer, ie:

```
COPY [‹drive›:]‹filename› PRN:
```

Example command:

```
COPY a:autoexec.bat PRN:
```

After a file is printed-out, a message similar to:

```
1 File(s) copied.
```

....will appear on the screen.

Wildcards

In each of the above types of command, 'wildcards' may be used to specify a range of files to print-out, rather than just one.

There are 2 types of wildcard: ? and *. The ? question mark wildcard may be used to represent one character in a filename which has any value. For example, the filename B?D.B?G could specify any number of files, eg: BAD.BAG, BED.BUG, BID.BIG, BUD.BOG, BCD.B3G, B4D.BEG, etc.

The * asterisk wildcard may represent any group of characters up to the end of the filename field. For example, the filename B*.* could specify any number of files, eg: BIG.TOE, BINARY.DTA, BREATHE.IN, B.TRE, BLANK. etc. Notice how in the last example (BLANK.) the * wildcard specified represents no characters at all. This is a perfectly valid use of the wildcard. Finally, the filename *.* means *all files.*

With wildcards in mind, therefore, you may print-out, for example, all '.BAT' files, using either of the commands:

```
PRINT a:*.bat      ....or....   COPY a:*.bat PRN:
```

Listing the disk directory to the printer

The disk directory may be listed to the printer (under any of DOS systems provided with your PC) by typing the command:

```
DIR >PRN
```

Alternatively, you may switch 'printer-echo' on (described in the next section) and list the directory to the screen.

Echoing screen output to the printer

The **[Ctrl] P** function may be used to echo screen output to the printer, ie. whatever is written to the screen is also printed-out by the DMP3000.

To switch printer-echo on, hold down the **[Ctrl]** key on your computer and press the **P** key once; then release both keys.

To switch printer-echo off, simply press **[Ctrl] P** again.

Until you cancel the first **[Ctrl] P** by pressing **[Ctrl] P** a second time, *everything* which is written to the screen (including > prompts and error messages) will be printed-out by the printer. (Note that pressing **[Ctrl] P** doesn't itself produce a printed character on the screen.)

To experiment with printer-echo, press **[Ctrl] P** and type:

```
DIR
```

....then press **[Ctrl] P** again.

Printing a screen dump

(Providing the facility is installed within the operating system you are currently using on your PC), you may *dump* the entire contents of the screen (as you see it) to the printer, using the ⇧ (shift) **[Prt Sc]** function.

Simply hold down the ⇧ (shift) key and press the **[Prt Sc]** key once.

Printing GEM files

GEM files may be printed-out using the 'Print Spooler' option from the GEM Desktop menu. For further information, see your PC manual.

Printing DOS Plus and CP/M files

Under the DOS Plus and CP/M operating systems, files may be sent to the printer using the PIP command. The form of the command is:

```
PIP LST:=[‹drive›:]‹filename›
```

Example command:

```
PIP LST:=a:autoexec.bat
```

....which will print the file 'autoexec.bat' (if it is present on the disk currently in Drive A:).

Unlike MS-DOS and PC-DOS, you may NOT specify wildcards within the filename using the above command.

Back to BASIC

Welcome back to those of you who skipped here from earlier in the chapter. We are now going to explore the features of the DMP3000 and you should note that from here-on, all the example commands will be shown in BASIC.

So, if you haven't already done so, start up BASIC on your PC and be ready to type in some commands.

The print buffer

Before printing any characters on the paper, the printer stores incoming information in an area of its own memory called the print buffer. In previous examples, the reason that the printer has printed-out everything it has been instructed to (rather than holding it in the buffer) is because each print statement has been automatically followed by a carriage return and line feed (this is executed by default) which has the action of emptying (or 'flushing') the buffer.

To explain the above, disregard the printer for a moment and concentrate on the screen.
If you compare the results of the following two programs:

```
10 PRINT 123
20 PRINT 456
30 PRINT 789

RUN

123
456   - results on screen
789
```

....and....

```
10 PRINT 123;
20 PRINT 456,
30 PRINT 789
RUN

123  456        789      - results on screen
```

....you can see that the semicolon and comma at the end of lines 10 and 20 have suppressed the carriage return and line feed on the screen.

Now modify the last program so that the three numbers are sent to the printer instead of the screen, ie:

```
10 LPRINT 123;
20 LPRINT 456,
30 LPRINT 789

RUN

123   456         789     - results on printer
```

Like the previous example, the results are printed-out on one line because the semicolon and comma have suppressed the carriage return/line feed to the printer. The data to be printed (in lines 10 and 20) is held inside the print buffer until the whole line is printed-out by an 'un-suppressed' `LPRINT` command (line 30).

REMEMBER: The `LPRINT` command (when it is not terminated by a semicolon or comma) automatically executes a carriage return and line feed.

Note that the buffer will always be flushed under the following conditions:

1. When the buffer is full.

2. When the printer is set off line.

3. When the printer receives a line feed.

Default character set

By default, the DMP3000 is supplied to you factory-set to reproduce IBM character set #2 (see appendix 2, table 3.2).

Type in the following test program to print-out part of the default character set:

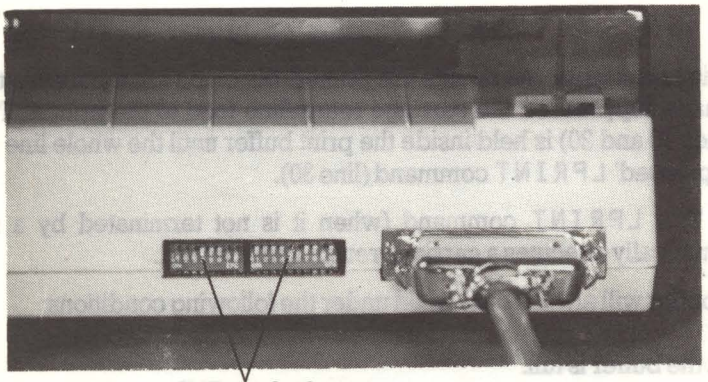
```
10 FOR n=32 TO 126
20    LPRINT CHR$(n);
30 NEXT
40 :
50 FOR n=160 TO 254
60    LPRINT CHR$(n);
70 NEXT
80 LPRINT

RUN
```

```
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmno
pqrstuvwxyz{|}~áíóúñÑªº¿⌐¬½¼¡«»
```

The default character set may, however, be altered by using a series of miniature switches (called DIP switches) at the rear of the printer.

How to adjust the DIP switches

IMPORTANT: Always switch the printer *off* before adjusting the DIP switches.



DIP switches

If you look carefully, you will note that there are 2 blocks (or banks) of switches. The first bank (called DS1) contains 8 switches, while the second bank (called DS2) contains 10. Each individual switch is numbered, and on the corner of each bank, you will see the word 'ON' (showing you the direction to switch on).

The two switches that select the default character set are numbers 7 and 8 on the first bank (DS1). From now on, we will refer to these switches as DS1-7 and DS1-8.

The following table indicates the different settings of DS1-7 and DS1-8 required to select the appropriate default character set.

CHARACTER SET	DS1-7	DS1-8
Epson FX - standard	OFF	OFF
Epson FX - NLQ	ON	OFF
IBM #1	OFF	ON
IBM #2	ON	ON

We will now set both DS1-7 and DS1-8 to the *off* position. This cancels IBM character set #2 and selects the Epson FX - standard character set. If you have difficulty in adjusting the

small DIP switches by finger, you may find it easier to use the tip of a ball-point pen or similar object.

Now switch the printer *on* and RUN the test program again. Note the different default character set reproduced:

```
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmno
pqrstuvwxyz{|}~ /"#$%&'()*+,-./0123456789:;<=>?@ABCD
EFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
```

For the moment, leave the DIP switches set to reproduce the Epson FX - standard character set.

NOTE: The default character set may also be selected via software. This method is described in chapter 6 ahead, under the section entitled 'Character table selection'.

International characters

What you see on the keyboard and the screen is not always what you get on the printer! To illustrate this point, look at the £ sign shown above the 3 key on the top line of your PC keyboard.

Now type in the command:

```
LPRINT "£5"
```

The screen display corresponds to what you just typed. However, look at what's been printed-out by the DMP3000:

```
#5
```

The # hash sign has been printed-out instead of the £ pound sign because the DMP3000 is supplied to you factory-set to reproduce the *USA* ASCII character set by default. (ASCII stands for American Standard Code for Information Interchange.)

Fortunately, for those of you who wish to print £ pound instead of # hash, the DMP3000 may be adjusted to do so by use of DIP switches at the rear of the printer.

The three DIP switches that control the printing of international characters are numbers 1, 2 and 3 on the first bank (DS1). Again, these will be referred to as DS1-1, DS1-2 and DS1-3.

IMPORTANT: To print international characters, IBM character set #1 or #2 must NOT be selected - ie. DIP switch DS1-8 must be *off*.

The following table indicates the settings of DS1-1, DS1-2 and DS1-3 to select the required international characters:

COUNTRY	DS1-1	DS1-2	DS1-3
USA	ON	ON	ON
France	OFF	ON	ON
Germany	ON	OFF	ON
UK	OFF	OFF	ON
Denmark	ON	ON	OFF
Sweden	OFF	ON	OFF
Italy	ON	OFF	OFF
Spain	OFF	OFF	OFF

Switch the printer off and adjust the DIP switches to the *UK* setting (DS1-1 *off*, DS1-2 *off*, DS1-3 *on*), then switch the printer on again.

Now type in the command:

```
LPRINT "£5"
```

....and you will see that the £ pound sign has been correctly reproduced.

Here is a table of the available international characters:

	CHARACTER CODE (HEX)											
	&23	&24	&40	&5B	&5C	&5D	&5E	&60	&7B	&7C	&7D	&7E
USA	#	$	@	[	\	]	^	`	{	¦	}	~
France	#	$	à	°	ç	§	^	`	é	ù	è	¨
Germany	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
UK	£	$	@	[	\	]	^	`	{	¦	}	~
Denmark	#	$	@	Æ	ø	Å	^	`	æ	ø	å	~
Sweden	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
Italy	#	$	@	°	\	é	^	ù	à	ò	è	ì
Spain	₧	$	@	¡	Ñ	¿	^	`	¨	ñ	}	~

NOTE: International character sets may also be selected via software. This method is described in chapter 6 ahead, under the section entitled 'International character set selection'.

You may now re-adjust the settings of DS1-7, DS1-8 (default character set) and DS1-1, DS1-2, DS1-3 (international characters) to suit your particular printing requirements.

(The functions of the remaining DIP switches (DS1-4 to DS1-6, and DS2-1 to DS2-10) are described in chapter 7 of this manual.)

How to change to an alternative typeface

The DMP3000 is capable of reproducing many combinations of different print style, or 'typeface'.

Here's one to try out. Type in:

```
LPRINT CHR$(27) + "x" + CHR$(1)
LPRINT "this is NLQ printing"
```

Look at the printing. You have selected the NLQ (Near Letter Quality) typeface.

(If NLQ printing hasn't been produced, check that you correctly typed in the above command, using a lower-case "x".)

To cancel the NLQ setting, type in:

```
LPRINT CHR$(27) + "x" + CHR$(Ø)
LPRINT "this is standard printing"
```

To select and cancel the NLQ setting, we have used what's known as a control code.

What is a control code?

A control code is used to call into action a function of the computer, while the code itself is not generally printed. `CHR$(7)` is a control code that makes the computer or the printer 'bleep'. Just try:

```
PRINT CHR$(7)      ....or....   LPRINT CHR$(7)
```

Now take a look at the commands we used to select and cancel NLQ printing. Notice that the first `LPRINT` statement had three parts (which were joined to each other by + plus signs). The three parts were:

1. `CHR$(27)`
2. `"x"`
3. `CHR$(1)` ....or.... `CHR$(Ø)`

Explanation

`CHR$(27)`

The `CHR$(27)` part is known as an 'escape code' (often shortened to ESC), and tells the printer that what follows is NOT to be printed-out, but is to be used for enabling or disabling one of the printer's functions. A sequence of instructions starting with `CHR$(27)` is known as an 'escape sequence'.

`"x"`

The `"x"` part of the command is the individual code-letter appertaining to NLQ operation. As you work through this guide, you will see that each particular printer function has its own code-letter.

`CHR$(1)` ....or.... `CHR$(Ø)`

The `CHR$(1)` or `CHR$(Ø)` part can be thought of as a switch to turn the particular function on or off. As you can see from the above examples, `CHR$(1)` switches the function *on*; `CHR$(Ø)` switches it *off*.

NOTE: In many of the examples that follow, the ASCII codes 'SOH' and 'NUL' are shown. These codes should be typed in as `CHR$(1)` and `CHR$(Ø)` respectively.

A 'shorthand' means of combining escape code parameters such as `"x" + CHR$(1)` (shown in the previous example) is to simply type in `"x1"`, ie. to select NLQ, type:

```
LPRINT CHR$(27) + "x1"
```

....and to cancel NLQ, type:

```
LPRINT CHR$(27) + "xØ"
```

Chapter 3
Selecting print styles....

Subjects covered in this chapter:

Choice of styles
Cancelling your choice
Combined styles
Illegal combinations

Choice of style

The DMP3000 is capable of over 100 different print style combinations. There are six main typefaces, known as:

Standard (sometimes known as 'Pica')
Mini (sometimes known as 'Elite')
Proportional
Condensed
NLQ-standard
NLQ-proportional

To these main typefaces, you may apply the following additional functions:

Subscript
Superscript
Double-strike
Italics
Bold

Finally, to any of the above combinations of typeface, you may apply:

Underline
Double-width

As you can see, there are lots of typefaces for you to choose from, and it's easy to get lost in a maze of combinations! It is perhaps worth remembering, therefore, that you can always get back to standard typeface (with no modifications) by switching the printer off, then on again.

The printer has a built-in memory of its own, so switching off or resetting your *computer* will NOT alter the printer's settings.

Selecting one of the main typefaces

Before we discuss all the different possible combinations of typeface and how to select them, let's start with the 6 main typefaces.

In each case, you will be shown the control code required to select or cancel the typeface, together with an example command.

Standard typeface

Standard typeface is automatically selected when the printer is first switched on, or when any combination of other typeface settings are cancelled. It is the one typeface that you do not have to explicitly *select*.

Mini typeface

TO SELECT: ESC M

Example command:

```
LPRINT CHR$(27) + "M"
LPRINT "this is mini typeface"
```

TO CANCEL: ESC P

Example command:

```
LPRINT CHR$(27) + "P"
LPRINT "this is standard typeface again"
```

Proportional typeface

TO SELECT: ESC p SOH

Example command:

```
LPRINT CHR$(27) + "p" + CHR$(1)
LPRINT "this is proportional typeface"
```

TO CANCEL: ESC p NUL

Example command:

```
LPRINT CHR$(27) + "p" + CHR$(Ø)
LPRINT "this is standard typeface again"
```

Condensed typeface

TO SELECT: SI (or ESC SI)

Example command:

```
LPRINT CHR$(15)
LPRINT "this is condensed typeface"
```

TO CANCEL: DC2

Example command:

```
LPRINT CHR$(18)
LPRINT "this is standard typeface again"
```

NLQ-standard typeface

TO SELECT: ESC x SOH

Example command:

```
LPRINT CHR$(27) + "x" + CHR$(1)
LPRINT "this is NLQ typeface"
```

NOTE: The NLQ-standard typeface may be manually selected by holding down the LF and ON LINE buttons together while switching the printer *on*.

TO CANCEL: ESC x NUL

Example command:

```
LPRINT CHR$(27) + "x" + CHR$(Ø)
LPRINT "this is standard typeface again"
```

NLQ-proportional typeface

TO SELECT: ESC x SOH ESC p SOH

Example command:

```
LPRINT CHR$(27)+"x"+CHR$(1)+CHR$(27)+"p"+CHR$(1)
LPRINT "this is NLQ-proportional typeface"
```

TO CANCEL: ESC x NUL ESC p NUL

Example command:

```
LPRINT CHR$(27)+"x"+CHR$(Ø)+CHR$(27)+"p"+CHR$(Ø)
LPRINT "this is standard typeface again"
```

Selecting additional functions

Having selected your main typeface, you may now modify it using the additional options available.

Subscript option

TO SELECT: ESC S SOH

Example command:

```
LPRINT CHR$(27) + "S" + CHR$(1)
LPRINT "this is subscript option"
```

TO CANCEL: ESC T

Example command:

```
LPRINT CHR$(27) + "T"
LPRINT "option cancelled"
```

Superscript option

TO SELECT: ESC S NUL

Example command:

```
LPRINT CHR$(27) + "S" + CHR$(Ø)
LPRINT "this is superscript option"
```

TO CANCEL: ESC T

Example command:

```
LPRINT CHR$(27) + "T"
LPRINT "option cancelled"
```

Double strike option

TO SELECT: ESC G

Example command:

```
LPRINT CHR$(27) + "G"
LPRINT "this is double strike option"
```

TO CANCEL: ESC T

Example command:

```
LPRINT CHR$(27) + "H"
LPRINT "option cancelled"
```

Italics option

TO SELECT: ESC 4

Example command:

```
LPRINT CHR$(27) + "4"
LPRINT "this is italics option"
```

TO CANCEL: ESC 5

Example command:

```
LPRINT CHR$(27) + "5"
LPRINT "option cancelled"
```

Bold option

TO SELECT: ESC E

Example command:

```
LPRINT CHR$(27) + "E"
LPRINT "this is bold option"
```

TO CANCEL: ESC F

Example command:

```
LPRINT CHR$(27) + "F"
LPRINT "option cancelled"
```

Selecting underline or double-width printing

Both underline and double-width printing may be added to any of the available combinations of typeface.

Underline option

TO SELECT: ESC - SOH

Example command:

```
LPRINT CHR$(27) + "-" + CHR$(1)
LPRINT "this is underline option"
```

TO CANCEL: ESC - NUL

Example command:

```
LPRINT CHR$(27) + "-" + CHR$(Ø)
LPRINT "option cancelled"
```

Double-width option

TO SELECT: SO (or ESC W SOH)

Example command:

```
LPRINT CHR$(14)
LPRINT "this is double width option"
```

TO CANCEL: DC4 (or ESC W NUL)

Example command:

```
LPRINT CHR$(20)
LPRINT "option cancelled"
```

Combining styles

Now that you know how to access each of the different typefaces, you might like to combine a few of them.

Make sure that your printer is set to standard typeface with no additional style options selected - (if in doubt, switch the printer off, then on again).

Example command (using mini typeface with italics and underline):

```
LPRINT CHR$(27) + "M" + "You can emphasise a point using" +
CHR$(27) + "4" + " italics" + CHR$(27) + "5" + " or" +
CHR$(27) + "-" + CHR$(1) + " underline" +  CHR$(27) + "-" +
CHR$(0) + CHR$(27) + "P"
```

Note that each of the typefaces and options selected in this example are cancelled after use. If you don't cancel them, they will be used in the next print statement.

Studying the above example, you could be forgiven for thinking that it looks muddled, and that it is difficult to pick out your typeface selections.

A solution to this problem is to first assign the escape codes into string variables as follows:

```
ms$ = CHR$(27) + "M"              : REM (mini select)
mc$ = CHR$(27) + "P"              : REM (mini cancel)
is$ = CHR$(27) + "4"              : REM (italics select)
ic$ = CHR$(27) + "5"              : REM (italics cancel)
us$ = CHR$(27) + "-" + CHR$(1) : REM (underline select)
uc$ = CHR$(27) + "-" + CHR$(0) : REM (underline cancel)
```

....and thereafter use the string variables' names to select or cancel a particular typeface. Our above example then looks like this:

```
LPRINT ms$ + "You can emphasise a point using" + is$ +
" italics" + ic$ + " or" + us$ + " underline" + uc$ + mc$
```

You can see that the example command is now shorter and much clearer. In addition you could use the escape code variables in all subsequent print statements. It's a good idea to have a ready-written program or routine like this to call upon when you're printing in various styles; no doubt you'll incorporate something along these lines into your own text creation utility program.

So let's create the beginnings of such a program. We'll use the above escape code variables and add a few more typefaces and options as we go along. Furthermore, to save you repeatedly typing in CHR$(27) and CHR$(1) and CHR$(Ø) we have assigned these characters to the variables e$, s$ and n$ respectively. Line numbers have also been added in case you wish to run the program more than once or save it. (Note that you need not type in the REM statements.)

```
10  REM printer control codes
20  e$ = CHR$(27)          : REM escape (ESC character)
30  s$ = CHR$(1)           : REM on (SOH character)
40  n$ = CHR$(Ø)           : REM off (NUL character)
50  ms$ = e$ + "M"         : REM (mini select)
60  mc$ = e$ + "P"         : REM (mini cancel)
70  is$ = e$ + "4"         : REM (italics select)
80  ic$ = e$ + "5"         : REM (italics cancel)
90  us$ = e$ + "-" + s$    : REM (underline select)
100 uc$ = e$ + "-" + n$    : REM (underline cancel)
110 ws$ = CHR$(14)         : REM (double width select)
120 wc$ = CHR$(2Ø)         : REM (double width cancel)
130 cs$ = CHR$(15)         : REM (condensed select)
140 cc$ = CHR$(18)         : REM (condensed cancel)

RUN
```

Now try this example:

```
LPRINT ms$ + "You can emphasise a point using " + is$ +
"italics " + ic$ +  "or " + us$ + "underline. " + uc$ + "You
can also spread out a bit using " + ws$ + "double width
characters, " + wc$ + mc$ + cs$ + "or even hide something in
the small print! " + cc$
```

Notice that before the last phrase is printed (in condensed typeface) the mini typeface is first cancelled (by mc$). This is because mini typeface and condensed typeface cannot be used together - it is an *illegal combination*. The final section in this chapter (see ahead) illustrates which typeface combinations are permitted and which are illegal.

Subscripts and superscripts

Add the following to your escape code variables program:

```
150 nss$ = e$ + "x" + s$ : REM (NLQ select)
160 nsc$ = e$ + "x" + n$ : REM (NLQ cancel)
170 sbs$ = e$ + "S" + s$ : REM (subscript select)
180 sps$ = e$ + "S" + n$ : REM (superscript select)
190 ssc$ = e$ + "T"      : REM (subscript and superscript cancel)

RUN
```

(Note that the string variable s s c $ cancels BOTH the subscript and the superscript options.)

Example command (using NLQ-standard typeface with subscripts and superscripts):

```
LPRINT nss$ + "Subscripts include H" + sbs$ + "2" + ssc$ +
"O and Log" + sbs$ + "10" + ssc$ + ", while superscripts
include 10" + sps$ + "-3" + ssc$ + " and 100" + sps$ + "o" +
ssc$ + "C." + nsc$
```

A few more assorted typefaces for your program:

```
200 ps$ = e$ + "p" + s$ : REM (proportional select)
210 pc$ = e$ + "p" + n$ : REM (proportional cancel)
220 ds$ = e$ + "G"      : REM (double strike select)
230 dc$ = e$ + "H"      : REM (double strike cancel)
240 bs$ = e$ + "E"      : REM (bold select)
250 bc$ = e$ + "F"      : REM (bold cancel)

RUN
```

Example commands (using proportional, double strike, and bold typefaces):

```
LPRINT ps$ + "Liberal/SDP members will favour the
proportional representation of their print-out" + pc$

LPRINT "Trade unionists will vote for the " + ds$ + "double
strike " + dc$ + "option"

LPRINT "Your mission: " + bs$ + "to boldly print like no
other printer" + bc$
```

In addition to the individual commands shown in this chapter, you may also select from a limited range of typeface combinations using the single escape code ESC ! ‹n›. This code is described in chapter 6 under the section entitled 'Print mode selection'.

Illegal combinations - what you can and can't do

Not all typefaces can be combined with all additional options. You cannot, for example, choose NLQ-proportional with bold italic subscripts. The following table illustrates the permitted typeface combinations available, and more importantly - the illegal ones.

NOTES:

1. A blank square indicates an illegal combination.
2. All options may include double-width and/or underlining.
3. When using standard typeface, you may select both the bold and italic options together.

	NORMAL (OFF)	DOUBLE STRIKE	SUB-SCRIPT	SUPER-SCRIPT	
STANDARD TYPEFACE	OK	OK	OK	OK	NORMAL (OFF)
	OK	OK	OK	OK	BOLD
	OK	OK	OK	OK	ITALICS
MINI TYPEFACE	OK	OK	OK	OK	NORMAL (OFF)
					BOLD
	OK	OK	OK	OK	ITALICS
PROPORTIONAL TYPEFACE	OK	OK			NORMAL (OFF)
					BOLD
	OK	OK			ITALICS
CONDENSED TYPEFACE	OK	OK	OK	OK	NORMAL (OFF)
					BOLD
	OK	OK	OK	OK	ITALICS
NLQ-STANDARD TYPEFACE	OK		OK	OK	NORMAL (OFF)
					BOLD
					ITALICS
NLQ-PROPORTIONAL TYPEFACE	OK				NORMAL (OFF)
					BOLD
					ITALICS
	NORMAL (OFF)	DOUBLE STRIKE	SUB-SCRIPT	SUPER-SCRIPT	

Chapter 4
Print formatting control....

Subjects covered in this chapter:

Print head movement
Form feed
Margin setting
Page length setting
Perforation skipping
Tabulation
Paper feed rate adjustment

NOTE: If, in the examples ahead, you wish to follow a control code by your own further printer instructions, then you should terminate the code with a semicolon to suppress the carriage return/line feed which will otherwise be automatically sent after the code.

Carriage return

This code sends the print head back to the beginning of the line, ready to start printing at the left-hand margin.

TO SELECT: CR

Example command:

```
LPRINT CHR$(13)
```

Line feed

This code feeds the paper up by one line so that the print head is ready to start printing on the next line. Line feed has the additional effect of outputting the contents of the buffer.

TO SELECT: LF

Example command:

```
LPRINT CHR$(10)
```

Backspace

This code moves the print head one space to the left.

TO SELECT: BS

Example command:

```
LPRINT CHR$(8)
```

Note that backspace will not operate during proportional printing.

Form feed

This code moves the print head to the start of the next page. It can be thought of as 'start a new page'.

TO SELECT: FF

Example command:

```
LPRINT CHR$(12)
```

Margins

The width of the page can be set by altering the margins outside of which the printer will not print:

Left margin setting

This code sets the left hand margin to the value of ‹n› (in the range 0 to 255). The value ‹n› represents the number of character columns from the left hand edge of the printer.

TO SELECT: ESC l ‹n›

Example command:

```
LPRINT CHR$(27) + "l" + CHR$(20)
```

Right margin setting

This code sets the right hand margin to the value of ‹n› (in the range 1 to 255). The value ‹n› represents the number of character columns from the *left* hand edge of the printer.

TO SELECT: ESC Q ‹n›

Example command:

```
LPRINT CHR$(27) + "Q" + CHR$(50)
```

Note that if the right hand margin is set to a value which is less than (or equal to) the left hand margin, then the right hand margin setting will be ignored.

Page length setting (by lines)

This code sets the page length to the value of ‹n› (in the range 1 to 127). The value ‹n› represents the number of lines per page. Note that changing the paper feed setting (described ahead) will not alter the page length.

TO SELECT: ESC C ‹n›

Example command:

```
LPRINT CHR$(27) + "C" + CHR$(15)
```

Page length setting (by inches)

This code sets the page length to the value of ‹n› (in the range 1 to 22). The value ‹n› represents the number of inches per page.

TO SELECT: ESC C NUL ‹n›

Example command:

```
LPRINT CHR$(27) + "C" + CHR$(0) + CHR$(4)
```

Skip perforation setting

When using continuous stationery (such as fan fold/tractor feed paper) the printer can be set to skip a number of lines when it reaches the foot of a page in order to avoid printing directly over the perforations in the paper.

This code sets skip perforation to the value of ‹n› (in the range 1 to 127). The value ‹n› represents the number of lines to be skipped at the foot of a page. This value is deducted from the page length setting (in lines or inches) if previously set.

TO SELECT: ESC N ‹n›

Example command:

```
LPRINT CHR$(27) + "N" + CHR$(5)
```

TO CANCEL: ESC O (note that this is the *capital letter* O)

Example command:

```
LPRINT CHR$(27) + "O"
```

Tabulation

It is possible to set up variable positions to which the print head can be moved. These are called tabulation settings or 'tabs' for short. Tabs can be set for vertical and horizontal positions. Once the tab positions have been set, the print head is sent to that position by the appropriate tab jump command.

The DMP3000 has an additional feature allowing vertical tabs to be set in different *channels*. A channel can then be selected and the tab settings for that channel used.

Horizontal tab setting

This code sets the horizontal tab positions. Up to 32 tab positions may be specified (each in the range 1 to 137).

TO SELECT: ESC D ‹n1› ‹n2› ‹n3› ....etc.... ‹n32› NUL

The value of ‹n2› should be greater than the value of ‹n1›, ‹n3› should be greater than ‹n2›, ‹n4› should be greater than ‹n3›, and so on. The sequence of tab numbers must be terminated by CHR$(Ø).

(When the printer is first switched on, horizontal tabs default to every 8 character positions.)

Example command:

```
LPRINT CHR$(27) + "D" + CHR$(10) + CHR$(20) + CHR$(0)
```

Horizontal tab jump

This code sends the print head to the next horizontal tab position.

TO SELECT: HT

Example command:

```
LPRINT CHR$(9)
```

Vertical tab setting

This code sets the vertical tab positions. Up to 16 tab positions may be specified (each in the range 1 to 254).

TO SELECT: ESC B ‹n1› ‹n2› ‹n3› ....etc.... ‹n16› NUL

The value of ‹n2› should be greater than the value of ‹n1›, ‹n3› should be greater than ‹n2›, ‹n4› should be greater than ‹n3›, and so on. The sequence of tab numbers must be terminated by `CHR$(0)`.

(When the printer is first switched on, vertical tabs default to single line feeds.)

Example command:

```
LPRINT CHR$(27) + "B" + CHR$(10) + CHR$(20) + CHR$(0)
```

Vertical tab jump

This code sends the print head to the next vertical tab position.

TO SELECT: VT

Example command:

```
LPRINT CHR$(11)
```

Tab channel setting

There are eight channels for which it is possible to set up to 16 vertical tab positions each. This feature is intended for applications where more than one type of page format is being used within a document. To use this feature, you should first set up the channel and tab settings (using ESC b ‹channel› ‹n1› ....etc.... NUL) for each of the required channels. You may thereafter select the appropriate channel (using ESC / ‹channel›) when you wish to call up a new set of tabs, and use the vertical tab jump (VT) code to move to the next tab position.

NOTE: If no channel tabs are set up or selected, channel 0 is assumed.

TO SELECT: ESC b ‹channel› ‹n1› ‹n2› ‹n3› ....etc.... ‹n16› NUL

The ‹channel› parameter must be in the range 0 to 7.

The value of ‹n2› should be greater than the value of ‹n1›, ‹n3› should be greater than ‹n2›, ‹n4› should be greater than ‹n3›, and so on. The sequence of tab numbers must be terminated by `CHR$(Ø)`.

Example command:

```
LPRINT CHR$(27) + "b" + CHR$(7) + CHR$(1Ø) + CHR$(2Ø) + CHR$(Ø)
```

Channel selection

This code selects the tab channel to be used (in the range 0 to 7).

TO SELECT: ESC / ‹channel›

Example command:

```
LPRINT CHR$(27) + "/" + CHR$(7)
```

All subsequent vertical tab jump (VT) codes will move the print head to the next vertical tab position for that particular channel.

Paper feed rates

When the printer is switched on, the paper feed rate defaults to 1/6 inch per line. However, the amount of paper fed per line can be altered using the following commands:

1/8 inch paper feed

TO SELECT: ESC Ø (note that this is the *number* Ø)

Example command:

```
LPRINT CHR$(27) + "Ø"
```

7/72 inch paper feed

TO SELECT: ESC 1

Example command:

```
LPRINT CHR$(27) + "1"
```

1/6 inch paper feed (default)

TO SELECT: ESC 2

Example command:

```
LPRINT CHR$(27) + "2"
```

Variable ‹n›/216 inch paper feed

This code sets the paper feed rate to ‹n›/216 inch. The value of ‹n› may be in the range 0 to 255.

TO SELECT: ESC 3 ‹n›

Example command:

```
LPRINT CHR$(27) + "3" + CHR$(27)
```

Variable ‹n›/72 inch paper feed

This code sets the paper feed rate to ‹n›/72 inch. The value of ‹n› may be in the range 0 to 85.

TO SELECT: ESC A ‹n›

Example command:

```
LPRINT CHR$(27) + "A" + CHR$(18)
```

Variable ‹n›/216 inch one-shot forward feed

This code executes a once-only forward paper feed of ‹n›/216 inch. The value of ‹n› may be in the range 0 to 255.

TO SELECT: ESC J ‹n›

Example command:

```
LPRINT CHR$(27) + "J" + CHR$(216)
```

Variable ‹n›/216 inch one-shot reverse feed

This code executes a once-only reverse paper feed of ‹n›/216 inch. The value of ‹n› may be in the range 0 to 255.

TO SELECT: ESC j ‹n›

Example command:

```
LPRINT CHR$(27) + "j" + CHR$(108)
```

WARNING: Do not attempt a reverse paper feed while printing within the top 30mm or the bottom 80mm of the paper, (or within 30mm of the perforations on tractor feed paper).

Chapter 5
Graphics printing....

Subjects covered in this chapter:

Introduction
Single, double, and quadruple density graphics
Bit image graphics modes

What is graphics printing?

In contrast to normal character printing mode, the DMP3000 offers what's known as 'graphics mode'. When set to this mode, the printer has a different way of interpreting the data it receives; instead of a character being printed *as is*, the data is used to directly control each of the tiny individual 'pins' inside the print head. For each item (byte) of data received, only one line of dots is drawn vertically. Whether or not a dot is drawn depends upon the byte of data sent. Each bit in the byte can be a 1 or a 0; a 1 indicates that a dot should be printed, a 0 indicates that a space should be left. This is known as 'bit image graphics'.

In graphics mode, control codes are also printed as bit image graphics (rather than being executed). This means that the effect of sending, for example, a carriage return or line feed will NOT be to execute the appropriate function, but to actually print-out a series of dots on the paper. Moreover, the graphics mode does NOT itself execute a carriage return and line feed automatically when it reaches the end of a line.

The graphics mode is entered using an escape code. Two further parameters are also included and these tell the printer how much data it should turn into dot graphics before reverting to normal character printing mode (in order to execute a carriage return, line feed, etc.). These parameters are known as ‹n1› and ‹n2›. The ‹n2› parameter represents the number of whole 256-dot portions to be printed, while the ‹n1› parameter represents the remainder of individual dots. Both of the parameters ‹n1› and ‹n2› must be in the range 0 to 255.

Hence, for example, if you were specifying a code to produce a graphics dump of a screen image 640 pixels wide, the parameter ‹n2› would be set to 2 (as there are 2 x 256 in 640), while ‹n1› would be set to 128 (the remainder). Such an example command may look like this:

```
LPRINT CHR$(27) + "L" + CHR$(128) + CHR$(2)
```

To calculate the values for ‹n1› and ‹n2›, you may use the following program:

```
10 INPUT "number of dots";d
20 PRINT "<n1> ="; d MOD 256
30 PRINT "<n2> =";  INT(d/256)

RUN
```

There is a maximum number of dots that can be printed on one line. If the maximum number is exceeded, then the additional data is ignored.

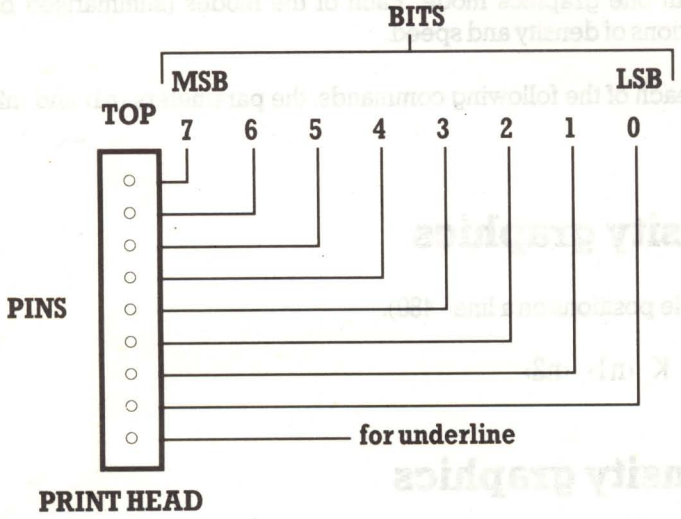
Type in the following example program:

```
10 LPRINT CHR$(27) + "K" + CHR$(126) + CHR$(0);
20 FOR n=1 TO 126
30     LPRINT CHR$(87);
40 NEXT

RUN
```

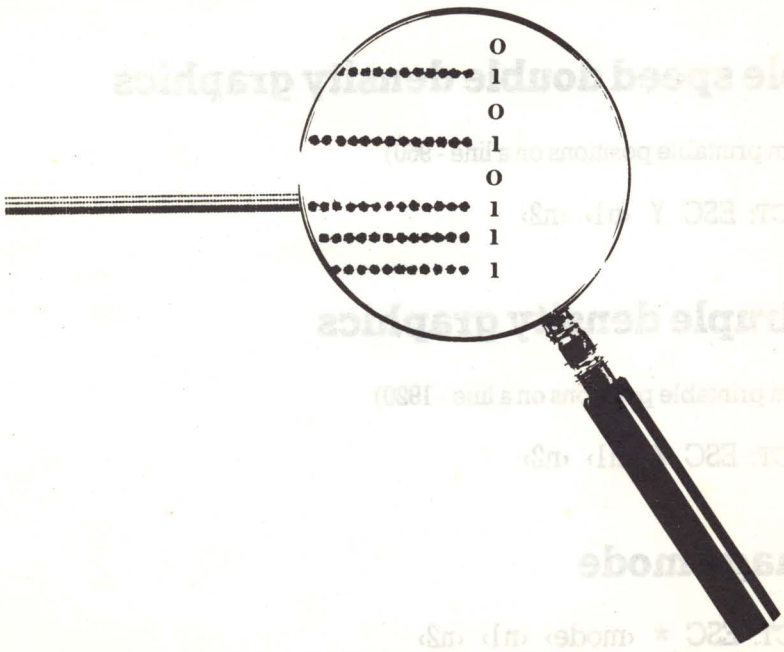
Note that the use of a semicolon to terminate the print statement (in line 10) which selects graphics mode is essential, as this suppresses the carriage return/line feed normally executed after a print statement, which would otherwise result in spurious dot patterns.

We have used 8 7 as our data in line 30 of the above example. This corresponds to the 8-bit binary number 01010111. Looking at the number in binary form you can see the effect of each 1 and 0 on the result.

The following diagram illustrates how each bit of data relates to a corresponding pin on the print head, which in turn produces a corresponding dot on the paper.



In the above example program, therefore, the graphics mode is selected in line 10, then the FOR....NEXT loop (lines 20 to 40) prints-out the binary data 01010111 as a column of dots downwards, 126 times along the paper. The result should look like this:



Try experimenting with different numbers in line 30 of the above example program to make sure that you understand the bit-to-dot correspondence.

Graphics modes

There is more than one graphics mode. Each of the modes (summarised below) offer differing combinations of density and speed.

REMEMBER: For each of the following commands, the parameters ‹n1› and ‹n2› are in the range 0 to 255.

Single density graphics

(Maximum printable positions on a line - 480)

TO SELECT: ESC K ‹n1› ‹n2›

Double density graphics

(Maximum printable positions on a line - 960)

TO SELECT: ESC L ‹n1› ‹n2›

Double speed double density graphics

(Maximum printable positions on a line - 960)

TO SELECT: ESC Y ‹n1› ‹n2›

Quadruple density graphics

(Maximum printable positions on a line - 1920)

TO SELECT: ESC Z ‹n1› ‹n2›

Bit image mode

TO SELECT: ESC * ‹mode› ‹n1› ‹n2›

....where the ‹mode› parameter is the required graphics mode (see the following table):

‹mode›	Number of dots/ 8 inch	Connecting dot density/8 inch	Head speed (inch/sec) DMP3160	DMP3000
0	480 single density	480	16	10.5
1	960 double density	960	8	5.25
2	960 double speed/double density	480	16	10.5
3	1920 quadruple density	960	8	5.25
4	640 CRT graphic	640	8	5.25
5	576 plotter graphic	576	13	8.7
6	720 CRT graphic	720	8	5.25

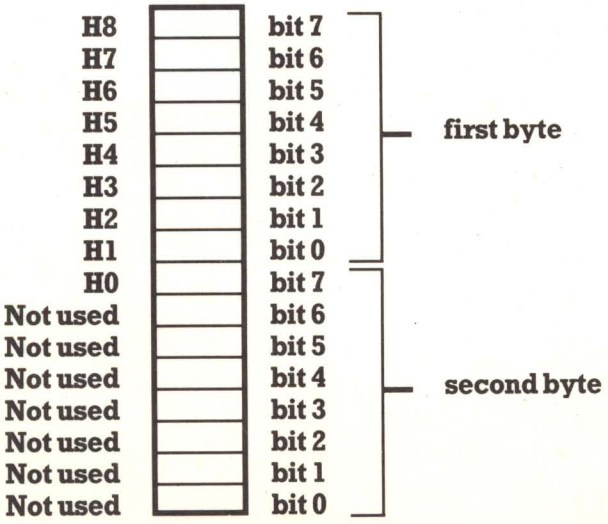
9-pin bit image mode

TO SELECT: ESC ↑ ‹mode› ‹n1› ‹n2›

....where the ‹mode› parameter is the required graphics mode (see the following table):

‹mode›	Maximum number of dots	Density
0	480	single density
1	960	double density

Two bytes of data should be sent for each printable position. The first is used as data for the top eight pins. Bit 7 of the second byte is used as the data for the bottom pin:



Bit image mode selection/change

TO SELECT: ESC ? ‹code› ‹mode›

....where the ‹code› parameter is one of the escape code letters K, L, Y, or Z (described earlier in this chapter), and where the ‹mode› parameter is in the range 0 to 6 (as previously described for the ESC * code).

Graphics character alignment

NOTE: When printing-out graphics characters or boxes whose vertical lines are to be continuous down the page (or when using ready-made graphics characters from IBM character sets #1 and #2), you should additionally select the code for uni-directional printing (ESC U SOH) described in chapter 6 ahead. This will afford more accurate alignment of the vertical lines.

Chapter 6
Extra functions....

Subjects covered in this chapter:

Incremental print
Printable code area expansion
Eighth bit setting
Control code printing
Reset, paper out, bell, and delete
Print head control
Character table selection
International character sets
Print mode selection
User defined characters
Hexadecimal dump

Incremental print

This code allows characters sent to the printer to be printed-out immediately. After printing, the paper is fed forward to allow the character(s) to be seen. The paper returns to the previous print position when it receives the next character.

TO SELECT: ESC i SOH

Example command:

```
LPRINT CHR$(27) + "i" + CHR$(1)
```

TO CANCEL: ESC i NUL

Example command:

```
LPRINT CHR$(27) + "i" + CHR$(Ø)
```

The following example program will set up the DMP3000 as a 'typewriter' - ie. characters typed in at the keyboard will be printed-out directly. Carriage returns should be used to terminate lines. Note that spaces will only be printed-out when followed by a printable character.

```
10 WHILE NOT escaped
20     a$=INKEY$
30     IF a$="" THEN 20
40     LPRINT CHR$(27) + "i" + CHR$(1);
50     IF a$=CHR$(13) THEN PRINT a$: LPRINT a$
60     PRINT a$;: LPRINT a$;
70     LPRINT CHR$(27) + "i" + CHR$(0);
80 WEND

RUN
```

WARNING: Do not attempt incremental printing within the bottom 80mm of the paper, (or within 30mm of the perforations on tractor feed paper).

Printable code area expansion

In non-IBM mode, ie. when using Epson FX character sets (tables 1 and 2), characters 128 to 159 and 255 (&80 to &9F and &FF hex) are by default non-printing control characters (see appendix 2).

This code overrides the default setting and makes available the following additional characters:

Table 1
Epson FX - standard

128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143
à	è	ù	ò	ì	°	£	¡	¿	Ñ	ñ	ª	º	ä	ç
&80	&81	&82	&83	&84	&85	&86	&87	&88	&89	&8A	&8B	&8C	&8D	&8E	&8F

144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159
ß	Ä	Æ	æ	Ø	ø	¨	Ä	Ö	Ü	ä	ö	ü	€	é	¥
&90	&91	&92	&93	&94	&95	&96	&97	&98	&99	&9A	&9B	&9C	&9D	&9E	&9F

255
Ø
&FF

Table 2
Epson FX - NLQ

128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143
&80	&81	&82	&83	&84	&85	&86	&87	&88	&89	&8A	&8B	&8C	&8D	&8E	&8F

144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159
&90	&91	&92	&93	&94	&95	&96	&97	&98	&99	&9A	&9B	&9C	&9D	&9E	&9F

255
&FF

TO SELECT: ESC 6

Example command:

```
LPRINT CHR$(27) + "6"
```

TO CANCEL: ESC 7

Example command:

```
LPRINT CHR$(27) + "7"
```

The above code will not operate under IBM character sets #1 or #2 (tables 3.1, 3.2, 4.1 and 4.2).

Example program:

```
10 LPRINT CHR$(27) + "m" + CHR$(0)
20 LPRINT CHR$(27) + "6"
30 FOR n=128 TO 159
40    LPRINT CHR$(n);
50 NEXT
60 LPRINT CHR$(255)

RUN
```

Set eighth bit

This code sets the eighth bit of every code sent to the printer to 1.

TO SELECT: ESC >

Example command:

```
LPRINT CHR$(27) + ">"
```

Unset eighth bit

This code sets the eighth bit of every code sent to the printer to 0.

TO SELECT: ESC =

Example command:

```
LPRINT CHR$(27) + "="
```

Accept eighth bit

This code cancels the above (set and unset) commands, directing the printer to accept all eight bits as they are received from the computer.

TO SELECT: ESC #

Example command:

```
LPRINT CHR$(27) + "#"
```

Control code printing

By default, control codes are executed when sent to the printer. This code allows instead, the printing-out of any following control codes (between 0 and 31).

Note that not all codes in this range can be set to produce printable characters.

TO SELECT: ESC I SOH

Example command:

```
LPRINT CHR$(27) + "I" + CHR$(1)
```

TO CANCEL: ESC I NUL

Example command:

```
LPRINT CHR$(27) + "I" + CHR$(Ø)
```

Reset printer

This code resets the printer. The printer will then perform as if it had just been switched on.

TO SELECT: ESC @

Example command:

```
LPRINT CHR$(27) + "@"
```

Paper out sensor disable

This code disables the action of the PAPER OUT sensor which halts the printer when there is no paper.

TO SELECT: ESC 8

Example command:

```
LPRINT CHR$(27) + "8"
```

Paper out sensor enable

This code re-enables the action of the PAPER OUT sensor.

TO SELECT: ESC 9

Example command:

```
LPRINT CHR$(27) + "9"
```

Bell

This code sounds the printer's internal bleeper.

TO SELECT: BEL

Example command:

```
LPRINT CHR$(7)
```

Delete

This code removes the last character from the printer's buffer.

TO SELECT: DEL

Example command:

```
LPRINT CHR$(127)
```

Note that the above code will not operate in the incremental print mode, nor will it delete any *control codes* in the buffer.

Home head

This code moves the print head to the home (leftmost) position.

TO SELECT: ESC <

Example command:

```
LPRINT CHR$(27) + "<"
```

Uni-directional printing

By default, the DMP3000 prints in both directions - left to right and right to left. This code selects printing from left to right only.

TO SELECT: ESC U SOH

Example command:

```
LPRINT CHR$(27) + "U" + CHR$(1)
```

TO CANCEL: ESC U NUL

Example command:

```
LPRINT CHR$(27) + "U" + CHR$(Ø)
```

NOTE: When printing-out graphics characters or boxes whose vertical lines are to be continuous down the page (or when using ready-made graphics characters from IBM character sets #1 and #2), you should additionally select uni-directional printing. This will afford more accurate alignment of the vertical lines.

Half speed

This code halves the speed of the print head's movement.

TO SELECT: ESC s SOH

Example command:

```
LPRINT CHR$(27) + "s" + CHR$(1)
```

TO CANCEL: ESC s NUL

Example command:

```
LPRINT CHR$(27) + "s" + CHR$(Ø)
```

Character table selection

The setting of DIP switches DS1-7 and DS1-8 (described in chapter 2) facilitates hardware selection of the default character set to be used when the printer is switched on. The following code allows the DIP switch settings to be overridden by software.

TO SELECT: ESC m ‹n›

....where ‹n› is in the range 0 to 2 to select the following character tables (see appendix 2):

‹n›	STANDARD TYPEFACE	NLQ TYPEFACE
0	Table 1	Table 2
1	Table 3.1	Table 4.1
2	Table 3.2	Table 4.2

Example command:

```
LPRINT CHR$(27) + "m" + CHR$(1)
```

The following example program uses the above code and selects NLQ typeface in order to print-out characters from table 4.2 (see appendix 2).

```
10 LPRINT CHR$(27) + "m" + CHR$(2)
20 LPRINT CHR$(27) + "x" + CHR$(1)
30 FOR c=3 TO 6
40    LPRINT CHR$(c)
50 NEXT

RUN
```

International character set selection

The setting of DIP switches DS1-1, DS1-2 and DS1-3 (described in chapter 2) facilitates hardware selection of the international characters to be used when the printer is switched on. The following code allows the DIP switch settings to be overridden by software.

TO SELECT: ESC R ‹n›

....where ‹n› is in the range 0 to 8 for the following countries:

‹n›	COUNTRY
0	USA
1	France
2	Germany
3	UK
4	Denmark
5	Sweden
6	Italy
7	Spain
8	Japan

Example command:

```
LPRINT CHR$(27) + "R" + CHR$(3)
```

The following example program prints-out (for each of the above countries - 0 to 8) the character numbers listed in line 100.

```
10 LPRINT CHR$(27) + "m" + CHR$(0)
20 FOR n=0 TO 8
30    RESTORE 100
40    LPRINT CHR$(27) + "R" + CHR$(n)
50    FOR c=1 TO 12
60       READ d
70       LPRINT "  "; CHR$(d);
80    NEXT
90 NEXT
100 DATA 35,36,64,91,92,93,94,96,123,124,125,126

RUN
```

IMPORTANT: To print international characters, IBM character set #1 or #2 must NOT be selected - ie. DIP switch DS1-8 must be *off*, or ESC m NUL selected.

Print mode selection

This code enables you to select a combination of some of the more commonly used typefaces and options, namely: standard, mini, condensed, bold, double strike and double width.

TO SELECT: ESC ! ‹n›

Example command:

```
LPRINT CHR$(27) + "!" + CHR$(17)
```

....where ‹n› is a bit-significant number selecting the typeface and option as follows:

Standard typeface	- set the value of ‹n› to 0
Mini typeface	- add 1 to the value of ‹n›
Condensed typeface	- add 4 to the value of ‹n›
Bold option	- add 8 to the value of ‹n›
Double strike option	- add 16 to the value of ‹n›
Double width option	- add 32 to the value of ‹n›

Thus, setting the value of ‹n› to 17 (as in the above example command) selects mini typeface (add 1) with the double strike option (add 16), ie. 1 + 16 = 17.

Remember that illegal combinations of typeface and option must be avoided when choosing the value of ‹n›. See the table at the end of chapter 3.

NOTE: Do not set the value of ‹n› to 9 as the printer will interpret this as a tab (HT) control character.

TO CANCEL: ESC ! NUL

Example command:

```
LPRINT CHR$(27) + "!" + CHR$(Ø)
```

User defined characters

The printer has the ability to print user defined characters. The following section outlines how to to go about defining (downloading) a character.

There are four main stages to go through before a downloaded character appears on the paper:

1. **Download character definition**
2. **Download character set selection**
3. **Control code printing selection**
4. **Printing of the character**

1. Download character definition

TO SELECT: ESC & NUL ‹first› ‹last› ‹attribute› ‹d1› ‹d2› ....etc.... ‹dll›
‹attribute› ‹d1› ‹d2› ....etc.... ‹dll›
‹attribute› ‹d1› ‹d2› ....etc.... ‹dll›
‹attribute› ‹d1› ‹d2› ....etc.... ‹dll›.
....etc....

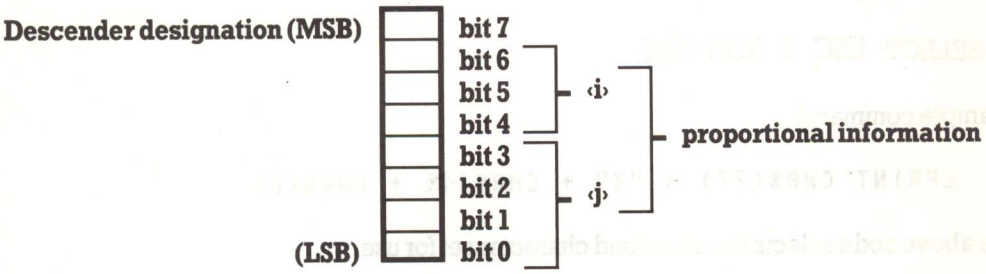
Example command:

```
LPRINT CHR$(27) + "&" + CHR$(Ø) + CHR$(5) + CHR$(5) + CHR$(11)
```

It is possible to define any of the characters in the range 0 to 31, though some of these cannot be displayed (as the control code takes precedence).

The ‹first› and ‹last› parameters specify the range of character numbers which are to be defined. The parameter ‹first› should be less than (or equal to) ‹last›. If ‹first› is less than ‹last›, then the data for the additional characters (‹attribute› ‹d1› .... ‹d11›) should be added onto the statement.

The ‹attribute› parameter is a bit significant number corresponding as follows:



....where ‹i› is the starting position (in the range 0 to 7), and ‹j› is the finishing position (in the range ‹i› + 4 to 11).

Bit 7 sets the descender designation: 0 to descend, 1 not to descend.

Bits 0 to 6 specify proportional information about the character.

The horizontal position of the character in the 11 column grid must be specified by giving start and finish positions.

Bits 4 to 7 contain the starting position which may be in the range 0 to 7. Bits 0 to 3 contain the finishing position which can be in the range (starting position + 4) to 11.

The minimum character size is 5.

The parameters ‹d1› to ‹d11› are the bit significant data for each vertical line of dots, corresponding as follows:

		‹d1›	‹d2›	‹d3›	‹d4›	‹d5›	‹d6›	‹d7›	‹d8›	‹d9›	‹d10›	‹d11›
(MSB)	bit 7											
	bit 6											
	bit 5											
	bit 4											
	bit 3											
	bit 2											
	bit 1											
(LSB)	bit 0											

The character is defined from left to right with the highest bit printed at the top of the character. Note that the printer is incapable of printing contiguous dots on the same horizontal line, and every other horizontally adjacent bit will be ignored if this is attempted. This will become clearer if you study the example at the end of this section.

2. Download character set selection

TO SELECT: ESC % SOH NUL

Example command:

```
LPRINT CHR$(27) + "%" + CHR$(1) + CHR$(Ø)
```

The above code selects the download character set for use.

TO CANCEL: ESC % NUL NUL

Example command:

```
LPRINT CHR$(27) + "%" + CHR$(Ø) + CHR$(Ø)
```

The above code de-selects the download character set and re-selects the internal character set.

For your reference, the following code copies the internal character set into the download set:

TO SELECT: ESC : NUL NUL NUL

Example command:

```
LPRINT CHR$(27) + ":" + CHR$(Ø) + CHR$(Ø) CHR$(Ø)
```

Note that when the printer is switched on, the download set is undefined.

3. Control code printing selection

As described earlier in this chapter (ESC I SOH).

4. Printing of the character

Simply send the download character to the printer.

Example program:

The following program uses the above sequence of operations to create a user defined character (a square box). The parameters ‹d1› to ‹d11› are read from the data at the end of the program. The data items' binary equivalents are included to illustrate the relationship between bits and dots.

(NOTE: If you intend to type in this program, you need not bother including the REM statements.)

```
10 REM download character definition
20 LPRINT CHR$(27) + "&" + CHR$(0) + CHR$(5) + CHR$(5) + CHR$(11);
30 FOR d=1 TO 11
40    READ n
50    LPRINT CHR$(n);
60 NEXT
70 :
80 REM download character set selection
90 LPRINT CHR$(27) + "%" + CHR$(1) + CHR$(0)
100 :
110 REM control code printing selection
120 LPRINT CHR$(27) + "I" + CHR$(1)
130 :
140 REM print-out the finished download character (40 times)
150 FOR p=1 TO 40
160    LPRINT CHR$(5);
170 NEXT
180 LPRINT
190 :
200 REM data for square box character
210 DATA 127 :REM binary 1111111
220 DATA 0   :REM binary 0000000
230 DATA 65  :REM binary 1000001
240 DATA 0   :REM binary 0000000
250 DATA 65  :REM binary 1000001
260 DATA 0   :REM binary 0000000
270 DATA 65  :REM binary 1000001
280 DATA 0   :REM binary 0000000
290 DATA 65  :REM binary 1000001
300 DATA 0   :REM binary 0000000
310 DATA 127 :REM binary 1111111

RUN
```

The program will produce the following results:

NOTE: For this example program to work, DIP switch DS2-4 must be set to the *on* position. (See chapter 7 for a table of all DIP switch functions.)

REMEMBER: Always switch the printer *off* before adjusting the DIP switches.

Hexadecimal dump

The DMP3000 has the ability to automatically print-out, in hexadecimal format, the value of each byte of data it receives. To select this mode, the printer must be switched *on* while the LF and FF buttons are held down together.

To illustrate this facility, load a piece of paper into the printer, switch the printer *off*, then hold down the LF and FF buttons together while switching the printer *on* again. The printer is now in the hex dump mode.

Start up BASIC on your PC and type:

```
10 REM abcdef
```

Now list this one-line program to the printer by typing:

```
LLIST
```

You should see the following hex codes printed out:
(If nothing is printed-out, set the printer off line.)

```
31  30  20  52  45  4D  20  61  62  63  64  65  66  0D  0A
```

....which are the ASCII codes (in hex) for the characters in the program you listed (including the line number and spaces) plus carriage return and line feed (0D and 0A).

In the hex dump mode, there will usually be some characters left in the buffer after printing. Therefore, when the printer has stopped, always set it off line to flush the buffer.

To cancel the hex dump mode, simply switch the printer *off*.

Chapter 7
For your reference....

Subjects covered in this chapter:

Technical Specification
Printer socket
Interface
DIP switch functions
Signal timing

Technical Specification

Print system:
Impact dot-matrix

Print speed:
160 CPS (standard) 40 CPS (NLQ) - DMP3160
105 CPS (standard) 26 CPS (NLQ) - DMP3000

Printing characteristics (vertical x horizontal):
9 x 9 (normal character)
9 x 10 (double width character)
8 x chosen amount (bit-image)
9 x chosen amount (9 pin bit-image)

96 characters ASCII + italics + international character sets
Normal character size: 2.1 (width) x 2.55 (height) mm

Print sizes:
Standard (Pica) - 10 CPI / 80 CPL
Mini (Elite) - 12 CPI / 96 CPL
Condensed - 17 CPI / 137 CPL
Double width standard - 5 CPI / 40 CPL
Double width mini - 6 CPI / 48 CPL
Double width condensed - 8.5 CPI / 68 CPL

Number of columns:
80 (standard)
40 (double width)
132 (condensed)
66 (double width condensed)

Line feed rates:

1/6 inch
1/8 inch
7/72 inch
‹n›/216 inch programmable
‹n›/72 inch programmable

Line feed speed:

160 mS (1/6 inch) - DMP3160
200 mS (1/6 inch) - DMP3000

Paper type:

4.5 to 10 inches fan-fold (tractor feed)
4 to 9.5 inches cut sheet or roll paper (friction feed)

Number of copies:

2 sheets (incl. original)
40 g/m^2 pressure-sensitive paper train

Interface:

Parallel (Centronics compatible)

Mains supply:

220-240 Volt AC 50 Hz

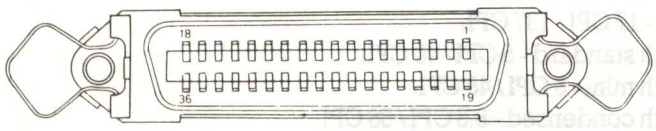
Dimensions:

16 (width) x 10 (depth) x 4 (height) inches
(400 x 250 x 100 mm)

Weight:

4.2 kg

Printer socket



Rear view of printer

Interface

PIN	DESIGNATION	I/O	DESCRIPTION
1	$\overline{\text{STROBE}}$	IN	Taking pin low enables receiving of DATA 0 to DATA 7. Minimum necessary pulse width is 0.5μS.
2	DATA 0 (LSB)	IN	8-bit data signal. Taking pin high or low corresponds to 1 and 0 respectively.
3	DATA 1		
4	DATA 2		
5	DATA 3		
6	DATA 4		
7	DATA 5		
8	DATA 6		
9	DATA 7 (MSB)		
10	$\overline{\text{ACKNOWLEDGE}}$	OUT	Active low output pulse generated when data entry and processing are completed. After this signal, subsequent data will be accepted. This signal is also generated when changing from off line to on line.
11	BUSY	OUT	Output high under any of the following conditions: a. Going off line. b. Paper feed or printing operation. c. When a control code is received.
12	PE	OUT	Output high when paper is out. (When on line, paper out is sensed after executing the paper feed command. When off line, paper out is always sensed.)
13	SELECT	OUT	On line and off line correspond to high and low respectively. When off line, DATA 0 to DATA 7 cannot be received.
14	$\overline{\text{AFD}}$	IN	Taking pin low generates line feed.
15	NC		
16	OV		
17	CHASSIS GND		
18	+5V	OUT	+5V (50mA max) power supply output.
19	GND		Signal ground.
20	GND		Signal ground.
21	GND		Signal ground.
22	GND		Signal ground.
23	GND		Signal ground.
24	GND		Signal ground.
25	GND		Signal ground.

PIN	DESIGNATION	I/O	DESCRIPTION
26	GND		Signal ground.
27	GND		Signal ground.
28	GND		Signal ground.
29	GND		Signal ground.
30	GND		Signal ground.
31	$\overline{\text{INPUT PRIME}}$	IN	Taking pin low initialises printer. Minimum necessary pulse width is 100μS.
32	$\overline{\text{FAULT}}$	OUT	Output low when off line.
33	GND		
34	NC		
35	+5V	OUT	
36	$\overline{\text{SLCT IN}}$	IN	Taking pin low or high sets printer on line or off line respectively (when the printer is not in error condition).

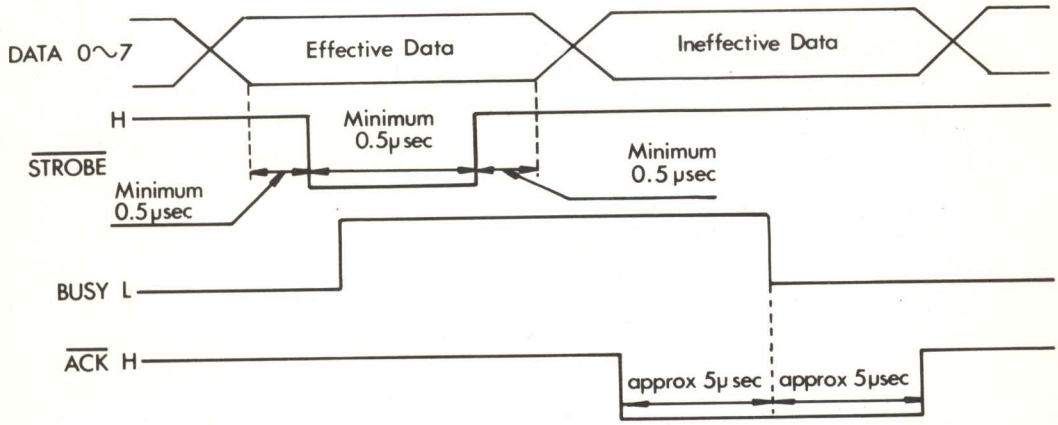
DIP switch functions

Chapter 2 described how to adjust DIP switches DS1-7, DS1-8 to select the default character set, and also how to adjust DS1-1, DS1-2, DS1-3 to select the required international characters. The following table indicates the functions of the remaining DIP switches:

SWITCH	FUNCTION	OFF	ON
DS1-1	International characters	See chapter 2	See chapter 2
DS1-2	International characters	See chapter 2	See chapter 2
DS1-3	International characters	See chapter 2	See chapter 2
DS1-4	CR function	CR only	CR & LF
DS1-5	Paper out sensor	Enable	Disable
DS1-6	Page length	11 inch	12 inch
DS1-7	Default character set	See chapter 2	See chapter 2
DS1-8	Default character set	See chapter 2	See chapter 2
DS2-1	Zero character	Unslashed	Slashed
DS2-2	Default skip perforation	Disable	Enable
DS2-3	Buffer mode	Character	Graphics
DS2-4	Buffer mode	Character/graphics	Download
DS2-5	SLCT IN signal	Not sent	Automatically sent
DS2-6	Alarm bleeper	Disable	Enable
DS2-7	Default typeface	Bold off	Condensed & bold on
DS2-8	Default typeface	Condensed off	Bold on
DS2-9	Do not use (factory-set)		
DS2-10	Do not use (factory-set)		

REMEMBER: Always switch the printer *off* before adjusting the DIP switches.

Signal timing



DATA input waveform

Appendix 1
Table of control codes

CODE	DECIMAL	HEX	FUNCTION
BEL	7	&07	Sound bleeper
BS	8	&08	Back space
HT	9	&09	Horizontal tab jump
LF	10	&0A	Line feed
VT	11	&0B	Vertical tab jump
FF	12	&0C	Form feed
CR	13	&0D	Carriage return
SO	14	&0E	Select double width
SI	15	&0F	Select condensed
DC1	17	&11	Device control 1
DC2	18	&12	Cancel condensed
DC3	19	&13	Device control 3
DC4	20	&14	Cancel double width
CAN	24	&18	Clear buffer
DEL	127	&7F	Delete last character from buffer
ESC SO	27 14	&1B &0E	Select double width
ESC SI	27 15	&1B &0F	Select condensed
ESC ! ‹parameter›	27 33 ‹n›	&1B &21 ‹n›	Select print mode
ESC #	27 35	&1B &23	Accept eighth bit
ESC % ‹parameters›	27 37 ‹n›..	&1B &25 ‹n›..	Select internal or download character set

CODE	DECIMAL	HEX	FUNCTION
ESC & NUL ‹parameters›	27 38 0 ‹n›..	&1B &26 &00 ‹n›..	Define download character
ESC * ‹parameters›	27 42 ‹n›..	&1B &2A ‹n›..	Select bit image graphics
ESC - ‹parameter›	27 45 ‹n›	&1B &2D ‹n›	Select or cancel underline
ESC / ‹parameter›	27 47 ‹n›	&1B &2F ‹n›	Select tab channel
ESC Ø	27 48	&1B &30	Select 1/8 inch paper feed
ESC 1	27 49	&1B &31	Select 7/72 inch paper feed
ESC 2	27 50	&1B &32	Select 1/6 inch paper feed
ESC 3 ‹parameter›	27 51 ‹n›	&1B &33 ‹n›	Select variable ‹n›/216 inch paper feed
ESC 4	27 52	&1B &34	Select italics
ESC 5	27 53	&1B &35	Cancel italics
ESC 6	27 54	&1B &36	Select printable code area expansion
ESC 7	27 55	&1B &37	Cancel printable code area expansion
ESC 8	27 56	&1B &38	Disable paper out detection
ESC 9	27 57	&1B &39	Enable paper out detection
ESC : NUL ‹parameters›	27 58 0 ‹n›..	&1B &3A &00 ‹n›..	Copy internal character set into download set
ESC <	27 60	&1B &3C	Home head

CODE	DECIMAL	HEX	FUNCTION
ESC =	27 61	&1B &3D	Unset eighth bit to 0
ESC >	27 62	&1B &3E	Set eighth bit to 1
ESC ? ‹parameters›	27 63 ‹n›..	&1B &3F ‹n›..	Select/change bit image mode
ESC @	27 64	&1B &40	Reset printer
ESC A ‹parameter›	27 65 ‹n›	&1B &41 ‹n›	Select variable ‹n›/72 inch paper feed
ESC B ‹parameters› NUL	27 66 ‹n›..0	&1B &42 ‹n›.. &00	Set vertical tabs
ESC C ‹parameters›	27 67 ‹n›..	&1B &43 ‹n›..	Set page length (by lines or inches)
ESC D ‹parameters› NUL	27 68 ‹n›.. 0	&1B &44 ‹n›.. &00	Set horizontal tabs
ESC E	27 69	&1B &45	Select bold
ESC F	27 70	&1B &46	Cancel bold
ESC G	27 71	&1B &47	Select double strike
ESC H	27 72	&1B &48	Cancel double strike
ESC I ‹parameter›	27 73 ‹n›	&1B &49 ‹n›	Select or cancel control code printing
ESC J ‹parameter›	27 74 ‹n›	&1B &4A ‹n›	Select variable ‹n›/216 inch one-shot forward feed
ESC K ‹parameters›	27 75 ‹n›..	&1B &4B ‹n›..	Select single density graphics
ESC L ‹parameters›	27 76 ‹n›..	&1B &4C ‹n›..	Select double density graphics
ESC M	27 77	&1B &4D	Select mini
ESC N ‹parameters›	27 78 ‹n›..	&1B &4E ‹n›..	Select skip perforation

CODE	DECIMAL	HEX	FUNCTION
ESC O	27 79	&1B &4F	Cancel skip perforation
ESC P	27 80	&1B &50	Cancel mini
ESC Q ‹parameter›	27 81 ‹n›	&1B &51 ‹n›	Set right margin
ESC R ‹parameter›	27 82 ‹n›	&1B &52 ‹n›	Select international character set
ESC S ‹parameter›	27 83 ‹n›	&1B &53 ‹n›	Select subscript or superscript
ESC T	27 84	&1B &54	Cancel subscript and superscript
ESC U ‹parameter›	27 85 ‹n›	&1B &55 ‹n›	Select or cancel uni-directional printing
ESC W ‹parameter›	27 87 ‹n›	&1B &57 ‹n›	Select or cancel double-width
ESC Y ‹parameters›	27 89 ‹n›..	&1B &59 ‹n›..	Select double speed double density graphics
ESC Z ‹parameters›	27 90 ‹n›..	&1B &5A ‹n›..	Select quadruple density graphics
ESC ↑ ‹parameters›	27 94 ‹n›..	&1B &5E ‹n›..	Select 9-pin bit image mode
ESC b ‹parameters› NUL	27 98 ‹n›.. 0	&1B &62 ‹n›.. &00	Set tabs in tab channel
ESC i ‹parameter›	27 105 ‹n›	&1B &69 ‹n›	Select or cancel incremental print
ESC j ‹parameter›	27 106 ‹n›	&1B &6A ‹n›	Select variable ‹n›/216 inch one-shot reverse feed
ESC l ‹parameter›	27 108 ‹n›	&1B &6C ‹n›	Set left margin
ESC m ‹parameter›	27 109 ‹n›	&1B &6D ‹n›	Select character table

CODE	DECIMAL	HEX	FUNCTION
ESC p ‹parameter›	27 112 ‹n›	&1B &70 ‹n›	Select or cancel proportional
ESC s ‹parameter›	27 115 ‹n›	&1B &73 ‹n›	Select or cancel half speed printing
ESC x ‹parameter›	27 120 ‹n›	&1B &78 ‹n›	Select or cancel NLQ

Appendix 2
Character tables

The following character tables may be selected using DIP switches DS1-7 and DS1-8 (see chapter 2 under the section entitled 'Default character set'), or alternatively, by the control code ESC M ‹n› (see chapter 6 under the section entitled 'Character table selection').

Table 1 (DS1-7 off, DS1-8 off)
Epson FX - standard

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
&00	&01	&02	&03	&04	&05	&06	&07	&08	&09	&0A	&0B	&0C	&0D	&0E	&0F	&10	&11	&12	&13

20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
													!	"	#	$	%	&	'
&14	&15	&16	&17	&18	&19	&1A	&1B	&1C	&1D	&1E	&1F	&20	&21	&22	&23	&24	&25	&26	&27

40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59
(	)	*	+	,	-	.	/	0	1	2	3	4	5	6	7	8	9	:	;
&28	&29	&2A	&2B	&2C	&2D	&2E	&2F	&30	&31	&32	&33	&34	&35	&36	&37	&38	&39	&3A	&3B

60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
<	=	>	?	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
&3C	&3D	&3E	&3F	&40	&41	&42	&43	&44	&45	&46	&47	&48	&49	&4A	&4B	&4C	&4D	&4E	&4F

80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_	`	a	b	c
&50	&51	&52	&53	&54	&55	&56	&57	&58	&59	&5A	&5B	&5C	&5D	&5E	&5F	&60	&61	&62	&63

100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119
d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w
&64	&65	&66	&67	&68	&69	&6A	&6B	&6C	&6D	&6E	&6F	&70	&71	&72	&73	&74	&75	&76	&77

....continued

Table 1 continued....

120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139
x	y	z	{	|	}	~													
&78	&79	&7A	&7B	&7C	&7D	&7E	&7F	&80	&81	&82	&83	&84	&85	&86	&87	&88	&89	&8A	&8B

140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159
&8C	&8D	&8E	&8F	&90	&91	&92	&93	&94	&95	&96	&97	&98	&99	&9A	&9B	&9C	&9D	&9E	&9F

160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179
	!	"	#	$	%	&	'	(	)	*	+	,	-	.	/	0	1	2	3
&A0	&A1	&A2	&A3	&A4	&A5	&A6	&A7	&A8	&A9	&AA	&AB	&AC	&AD	&AE	&AF	&B0	&B1	&B2	&B3

180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199
4	5	6	7	8	9	:	;	<	=	>	?	@	A	B	C	D	E	F	G
&B4	&B5	&B6	&B7	&B8	&B9	&BA	&BB	&BC	&BD	&BE	&BF	&C0	&C1	&C2	&C3	&C4	&C5	&C6	&C7

200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219
H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	[
&C8	&C9	&CA	&CB	&CC	&CD	&CE	&CF	&D0	&D1	&D2	&D3	&D4	&D5	&D6	&D7	&D8	&D9	&DA	&DB

220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239
\	]	^	_	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
&DC	&DD	&DE	&DF	&E0	&E1	&E2	&E3	&E4	&E5	&E6	&E7	&E8	&E9	&EA	&EB	&EC	&ED	&EE	&EF

240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255
p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	
&F0	&F1	&F2	&F3	&F4	&F5	&F6	&F7	&F8	&F9	&FA	&FB	&FC	&FD	&FE	&FF

Table 2 (DS1-7 on, DS1-8 off)
Epson FX - NLQ

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
&00	&01	&02	&03	&04	&05	&06	&07	&08	&09	&0A	&0B	&0C	&0D	&0E	&0F	&10	&11	&12	&13

20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
													!	"	#	$	%	&	'
&14	&15	&16	&17	&18	&19	&1A	&1B	&1C	&1D	&1E	&1F	&20	&21	&22	&23	&24	&25	&26	&27

40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59
(	)	*	+	,	-	.	/	0	1	2	3	4	5	6	7	8	9	:	;
&28	&29	&2A	&2B	&2C	&2D	&2E	&2F	&30	&31	&32	&33	&34	&35	&36	&37	&38	&39	&3A	&3B

60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
<	=	>	?	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
&3C	&3D	&3E	&3F	&40	&41	&42	&43	&44	&45	&46	&47	&48	&49	&4A	&4B	&4C	&4D	&4E	&4F

80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_	`	a	b	c
&50	&51	&52	&53	&54	&55	&56	&57	&58	&59	&5A	&5B	&5C	&5D	&5E	&5F	&60	&61	&62	&63

100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119
d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w
&64	&65	&66	&67	&68	&69	&6A	&6B	&6C	&6D	&6E	&6F	&70	&71	&72	&73	&74	&75	&76	&77

....continued

Table 2 continued....

120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139
x	y	z	{	|	}	~													
&78	&79	&7A	&7B	&7C	&7D	&7E	&7F	&80	&81	&82	&83	&84	&85	&86	&87	&88	&89	&8A	&8B

140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159
&8C	&8D	&8E	&8F	&90	&91	&92	&93	&94	&95	&96	&97	&98	&99	&9A	&9B	&9C	&9D	&9E	&9F

160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179
	!	"	#	$	%	&	'	(	)	*	+	,	-	.	/	0	1	2	3
&A0	&A1	&A2	&A3	&A4	&A5	&A6	&A7	&A8	&A9	&AA	&AB	&AC	&AD	&AE	&AF	&B0	&B1	&B2	&B3

180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199
4	5	6	7	8	9	:	;	<	=	>	?	@	A	B	C	D	E	F	G
&B4	&B5	&B6	&B7	&B8	&B9	&BA	&BB	&BC	&BD	&BE	&BF	&C0	&C1	&C2	&C3	&C4	&C5	&C6	&C7

200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219
H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	[
&C8	&C9	&CA	&CB	&CC	&CD	&CE	&CF	&D0	&D1	&D2	&D3	&D4	&D5	&D6	&D7	&D8	&D9	&DA	&DB

220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239
\	]	^	_	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
&DC	&DD	&DE	&DF	&E0	&E1	&E2	&E3	&E4	&E5	&E6	&E7	&E8	&E9	&EA	&EB	&EC	&ED	&EE	&EF

240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255
p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	
&F0	&F1	&F2	&F3	&F4	&F5	&F6	&F7	&F8	&F9	&FA	&FB	&FC	&FD	&FE	&FF

Table 3.1 (DS1-7 off, DS1-8 on)
IBM character set #1 - standard

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
&00	&01	&02	&03	&04	&05	&06	&07	&08	&09	&0A	&0B	&0C	&0D	&0E	&0F	&10	&11	&12	&13

20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
													!	"	#	$	%	&	'
&14	&15	&16	&17	&18	&19	&1A	&1B	&1C	&1D	&1E	&1F	&20	&21	&22	&23	&24	&25	&26	&27

40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59
(	)	*	+	,	-	.	/	0	1	2	3	4	5	6	7	8	9	:	;
&28	&29	&2A	&2B	&2C	&2D	&2E	&2F	&30	&31	&32	&33	&34	&35	&36	&37	&38	&39	&3A	&3B

60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
<	=	>	?	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
&3C	&3D	&3E	&3F	&40	&41	&42	&43	&44	&45	&46	&47	&48	&49	&4A	&4B	&4C	&4D	&4E	&4F

80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_	`	a	b	c
&50	&51	&52	&53	&54	&55	&56	&57	&58	&59	&5A	&5B	&5C	&5D	&5E	&5F	&60	&61	&62	&63

100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119
d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w
&64	&65	&66	&67	&68	&69	&6A	&6B	&6C	&6D	&6E	&6F	&70	&71	&72	&73	&74	&75	&76	&77

....continued

Table 3.1 continued....

120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139
×	Y	Z	‹	:	›	~													
&78	&79	&7A	&7B	&7C	&7D	&7E	&7F	&80	&81	&82	&83	&84	&85	&86	&87	&88	&89	&8A	&8B

140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159
&8C	&8D	&8E	&8F	&90	&91	&92	&93	&94	&95	&96	&97	&98	&99	&9A	&9B	&9C	&9D	&9E	&9F

160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179
á	í	ó	ú	ñ	Ñ	ª	º	¿	⌐	¬	½	¼	¡	«	»	▒	▓	▓	▏
&A0	&A1	&A2	&A3	&A4	&A5	&A6	&A7	&A8	&A9	&AA	&AB	&AC	&AD	&AE	&AF	&B0	&B1	&B2	&B3

180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199
┤	╡	╢	╖	╕	╣	║	╗	╝	╜	╛	┐	└	┴	┬	├	─	┼	╞	╟
&B4	&B5	&B6	&B7	&B8	&B9	&BA	&BB	&BC	&BD	&BE	&BF	&C0	&C1	&C2	&C3	&C4	&C5	&C6	&C7

200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219
└	┌	┴	┬	├	─	┼	╧	╨	╤	╥	╙	╘	╒	╓	╫	╪	┘	┌	■
&C8	&C9	&CA	&CB	&CC	&CD	&CE	&CF	&D0	&D1	&D2	&D3	&D4	&D5	&D6	&D7	&D8	&D9	&DA	&DB

220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239
▄	▌	▐	▀	α	ß	Γ	π	Σ	σ	µ	τ	Φ	Θ	Ω	δ	∞	ø	∈	∩
&DC	&DD	&DE	&DF	&E0	&E1	&E2	&E3	&E4	&E5	&E6	&E7	&E8	&E9	&EA	&EB	&EC	&ED	&EE	&EF

240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255
≡	±	≥	≤	⌠	⌡	÷	≈	°	∙	·	√	ⁿ	²	■	
&F0	&F1	&F2	&F3	&F4	&F5	&F6	&F7	&F8	&F9	&FA	&FB	&FC	&FD	&FE	&FF

Table 3.2 (DS1-7 on, DS1-8 on)
IBM character set #2 - standard

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
			♥	♦	♣	♠													
&00	&01	&02	&03	&04	&05	&06	&07	&08	&09	&0A	&0B	&0C	&0D	&0E	&0F	&10	&11	&12	&13

20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
	§												!	"	#	$	%	&	'
&14	&15	&16	&17	&18	&19	&1A	&1B	&1C	&1D	&1E	&1F	&20	&21	&22	&23	&24	&25	&26	&27

40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59
(	)	*	+	,	—	.	/	0	1	2	3	4	5	6	7	8	9	:	;
&28	&29	&2A	&2B	&2C	&2D	&2E	&2F	&30	&31	&32	&33	&34	&35	&36	&37	&38	&39	&3A	&3B

60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
<	=	>	?	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
&3C	&3D	&3E	&3F	&40	&41	&42	&43	&44	&45	&46	&47	&48	&49	&4A	&4B	&4C	&4D	&4E	&4F

80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_	`	a	b	c
&50	&51	&52	&53	&54	&55	&56	&57	&58	&59	&5A	&5B	&5C	&5D	&5E	&5F	&60	&61	&62	&63

100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119
d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w
&64	&65	&66	&67	&68	&69	&6A	&6B	&6C	&6D	&6E	&6F	&70	&71	&72	&73	&74	&75	&76	&77

....continued

Table 3.2 continued....

120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139
x	y	z	{	|	}	~		Ç	ü	é	â	ä	à	å	ç	ê	ë	è	ï
&78	&79	&7A	&7B	&7C	&7D	&7E	&7F	&80	&81	&82	&83	&84	&85	&86	&87	&88	&89	&8A	&8B

140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159
î	ì	Ä	Å	É	æ	Æ	ô	ö	ò	û	ù	ÿ	Ö	Ü	¢	£	¥	₧	ƒ
&8C	&8D	&8E	&8F	&90	&91	&92	&93	&94	&95	&96	&97	&98	&99	&9A	&9B	&9C	&9D	&9E	&9F

160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179
á	í	ó	ú	ñ	Ñ	ª	º	¿	⌐	¬	½	¼	¡	«	»	▒	▓	▓	|
&A0	&A1	&A2	&A3	&A4	&A5	&A6	&A7	&A8	&A9	&AA	&AB	&AC	&AD	&AE	&AF	&B0	&B1	&B2	&B3

180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199
┤	╡	╢	╖	╕	╣	║	╗	╝	╜	╛	┐	└	┴	┬	├	─	┼	╞	╟
&B4	&B5	&B6	&B7	&B8	&B9	&BA	&BB	&BC	&BD	&BE	&BF	&C0	&C1	&C2	&C3	&C4	&C5	&C6	&C7

200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219
└	┌	┴	┬	├	─	┼	╧	╨	╤	╥	╙	╘	╒	╓	╫	╪	┘	┌	■
&C8	&C9	&CA	&CB	&CC	&CD	&CE	&CF	&D0	&D1	&D2	&D3	&D4	&D5	&D6	&D7	&D8	&D9	&DA	&DB

220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239
▄	▌	▐	▀	α	ß	Γ	π	Σ	σ	µ	τ	Φ	Θ	Ω	δ	∞	ø	∈	∩
&DC	&DD	&DE	&DF	&E0	&E1	&E2	&E3	&E4	&E5	&E6	&E7	&E8	&E9	&EA	&EB	&EC	&ED	&EE	&EF

240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255
≡	±	≥	≤	⌠	⌡	÷	≈	°	∙	·	√	ⁿ	²	■	
&F0	&F1	&F2	&F3	&F4	&F5	&F6	&F7	&F8	&F9	&FA	&FB	&FC	&FD	&FE	&FF

NOTE: For tables 4.1 and 4.2 select NLQ typeface and use the same DIP switch settings as for tables 3.1 and 3.2 respectively.

Table 4.1 (DS1-7 off, DS1-8 on)
IBM character set #1 - NLQ

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
&00	&01	&02	&03	&04	&05	&06	&07	&08	&09	&0A	&0B	&0C	&0D	&0E	&0F	&10	&11	&12	&13

20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
													!	"	#	$	%	&	'
&14	&15	&16	&17	&18	&19	&1A	&1B	&1C	&1D	&1E	&1F	&20	&21	&22	&23	&24	&25	&26	&27

40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59
(	)	*	+	,	—	.	/	0	1	2	3	4	5	6	7	8	9	:	;
&28	&29	&2A	&2B	&2C	&2D	&2E	&2F	&30	&31	&32	&33	&34	&35	&36	&37	&38	&39	&3A	&3B

60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
<	=	>	?	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
&3C	&3D	&3E	&3F	&40	&41	&42	&43	&44	&45	&46	&47	&48	&49	&4A	&4B	&4C	&4D	&4E	&4F

80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_	`	a	b	c
&50	&51	&52	&53	&54	&55	&56	&57	&58	&59	&5A	&5B	&5C	&5D	&5E	&5F	&60	&61	&62	&63

100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119
d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w
&64	&65	&66	&67	&68	&69	&6A	&6B	&6C	&6D	&6E	&6F	&70	&71	&72	&73	&74	&75	&76	&77

....continued

Table 4.1 continued....

120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139
x	y	z	{	:	}	~													
&78	&79	&7A	&7B	&7C	&7D	&7E	&7F	&80	&81	&82	&83	&84	&85	&86	&87	&88	&89	&8A	&8B

140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159
&8C	&8D	&8E	&8F	&90	&91	&92	&93	&94	&95	&96	&97	&98	&99	&9A	&9B	&9C	&9D	&9E	&9F

160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179
á	í	ó	ú	ñ	Ñ	ª	º	¿	⌐	¬	½	¼	¡	«	»	▒	▓	▒	|
&A0	&A1	&A2	&A3	&A4	&A5	&A6	&A7	&A8	&A9	&AA	&AB	&AC	&AD	&AE	&AF	&B0	&B1	&B2	&B3

180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199
┤	╡	╢	╖	╕	╣	║	╗	╝	╜	╛	┐	└	┴	┬	├	─	┼	╞	╟
&B4	&B5	&B6	&B7	&B8	&B9	&BA	&BB	&BC	&BD	&BE	&BF	&C0	&C1	&C2	&C3	&C4	&C5	&C6	&C7

200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219
└	┌	┴	┬	├	─	┼	╧	╨	╤	╥	╙	╘	╒	╓	╫	╪	┘	┌	▉
&C8	&C9	&CA	&CB	&CC	&CD	&CE	&CF	&D0	&D1	&D2	&D3	&D4	&D5	&D6	&D7	&D8	&D9	&DA	&DB

220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239
▄	▌	▐	▀	α	ß	Γ	π	Σ	σ	µ	τ	Φ	Θ	Ω	δ	∞	ø	∈	∩
&DC	&DD	&DE	&DF	&E0	&E1	&E2	&E3	&E4	&E5	&E6	&E7	&E8	&E9	&EA	&EB	&EC	&ED	&EE	&EF

240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255
≡	±	≥	≤	⌠	⌡	÷	≈	°	∙	·	√	n	2	■	
&F0	&F1	&F2	&F3	&F4	&F5	&F6	&F7	&F8	&F9	&FA	&FB	&FC	&FD	&FE	&FF

Table 4.2 (DS1-7 on, DS1-8 on)
IBM character set #2 - NLQ

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
			♥	♦	♣	♠													
&00	&01	&02	&03	&04	&05	&06	&07	&08	&09	&0A	&0B	&0C	&0D	&0E	&0F	&10	&11	&12	&13

20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
	§												!	"	#	$	%	&	'
&14	&15	&16	&17	&18	&19	&1A	&1B	&1C	&1D	&1E	&1F	&20	&21	&22	&23	&24	&25	&26	&27

40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59
(	)	*	+	,	—	.	/	0	1	2	3	4	5	6	7	8	9	:	;
&28	&29	&2A	&2B	&2C	&2D	&2E	&2F	&30	&31	&32	&33	&34	&35	&36	&37	&38	&39	&3A	&3B

60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
<	=	>	?	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
&3C	&3D	&3E	&3F	&40	&41	&42	&43	&44	&45	&46	&47	&48	&49	&4A	&4B	&4C	&4D	&4E	&4F

80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_	`	a	b	c
&50	&51	&52	&53	&54	&55	&56	&57	&58	&59	&5A	&5B	&5C	&5D	&5E	&5F	&60	&61	&62	&63

100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119
d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w
&64	&65	&66	&67	&68	&69	&6A	&6B	&6C	&6D	&6E	&6F	&70	&71	&72	&73	&74	&75	&76	&77

....continued

Table 4.2 continued....

120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139
x	y	z	{	¦	}	~		Ç	ü	é	â	ä	à	å	ç	ê	ë	è	ï
&78	&79	&7A	&7B	&7C	&7D	&7E	&7F	&80	&81	&82	&83	&84	&85	&86	&87	&88	&89	&8A	&8B

140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159
î	ì	Ä	Å	É	æ	Æ	ô	ö	ò	û	ù	ÿ	Ö	Ü	¢	£	¥	₧	ƒ
&8C	&8D	&8E	&8F	&90	&91	&92	&93	&94	&95	&96	&97	&98	&99	&9A	&9B	&9C	&9D	&9E	&9F

160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179
á	í	ó	ú	ñ	Ñ	ª	º	¿	⌐	¬	½	¼	¡	«	»	▒	▓	▒	|
&A0	&A1	&A2	&A3	&A4	&A5	&A6	&A7	&A8	&A9	&AA	&AB	&AC	&AD	&AE	&AF	&B0	&B1	&B2	&B3

180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199
┤	╡	╢	╖	╕	╣	║	╗	╝	╜	╛	┐	└	┴	┬	├	─	┼	╞	╟
&B4	&B5	&B6	&B7	&B8	&B9	&BA	&BB	&BC	&BD	&BE	&BF	&C0	&C1	&C2	&C3	&C4	&C5	&C6	&C7

200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219
└	┌	┴	┬	├	─	┼	╧	╨	╤	╥	└	└	┌	┌	┼	┼	┘	┌	■
&C8	&C9	&CA	&CB	&CC	&CD	&CE	&CF	&D0	&D1	&D2	&D3	&D4	&D5	&D6	&D7	&D8	&D9	&DA	&DB

220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239
▄	▌	▐	▀	α	ß	Γ	π	Σ	σ	µ	τ	Φ	Θ	Ω	δ	∞	ø	∈	∩
&DC	&DD	&DE	&DF	&E0	&E1	&E2	&E3	&E4	&E5	&E6	&E7	&E8	&E9	&EA	&EB	&EC	&ED	&EE	&EF

240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255
≡	±	≥	≤	⌠	⌡	÷	≈	°	∙	·	√	ⁿ	²	■	
&F0	&F1	&F2	&F3	&F4	&F5	&F6	&F7	&F8	&F9	&FA	&FB	&FC	&FD	&FE	&FF

NOTE: The printing of international characters using the character codes shown in chapter 2 (either by DIP switch DS1-1, DS1-2, DS1-3 selection, or by use of the ESC R ‹n› control code) is NOT possible while IBM character set #1 or #2 is in use. If, therefore, you wish to print international characters, ensure that DIP switch DS1-8 is *off*.

Appendix 3
Index

A

Alarm bleeper 14, 31, 62, 74
Alignment of characters 56
AMSTRAD computers 1, 13
ASCII 17, 29, 32, 70

B

Backspace 44
BASIC 18, 21, 26
BBC Microcomputer 1, 13
Bell 62
Bit image graphics 51, 54, 55, 56
Bleeper 14, 31, 62, 74
Bold printing 38, 65
Buffer 26, 43, 62

C

Carriage return 43, 74
Centronics interface 12, 73
Changing typeface 31, 65
Character alignment 56
Character set 27, 58, 63, 83
Character tables 27, 58, 63, 83
Commodore computer 1, 13
Compatibility 1
Condensed typeface 35, 65
Connecting to a home computer 13
Connecting to a PC 12
Connecting to mains supply 7, 14
Control codes 31, 43, 51, 58, 60, 62, 77
Control layout 14
CP/M files 25

D

Deleting characters 62
Denmark 30, 64
Descender 67
DIP switches 28, 74
Disk directory 24, 25
DOS files 23
DOS Plus 23, 25
Double density graphics 54
Double speed double density graphics 54
Double strike printing 37, 65
Double width printing 38, 65
Download characters 66, 74
Dump (hexadecimal) 70

E

Echoing screen output to printer 24
Eighth bit setting 60
Elite typeface 33
Epson character set 28, 58, 83, 85
Escape code 32
ESC code 32

F

FF button 17, 18
Filenames 22, 24
Flushing the buffer 26, 27
Foreign characters 29, 58, 64
Form feed 17, 18, 44
France 30, 64
Friction/tractor switch 15

G

GEM files 25
Germany 30, 64
Graphics character set 27, 29, 56, 87, 89, 91, 93
Graphics printing 51, 56, 74

H

Half speed printing 63
Hexadecimal dump 70
Home head 62
Horizontal tab 46, 47

I

IBM BASIC 18
IBM character set 27, 29, 56, 87, 89, 91, 93
IBM PC 12, 13
Incremental printing 57
Ink ribbon 7, 10
Interface 73
Internal character set 68
International characters 29, 58, 64
Italics printing 37
Italy 30, 64

J

Japan 64

L

Layout of controls 14
Left margin 44
Legs 19, 20
LF button 16, 18
Line feed 16, 43, 74
Listing a program 21
Listing the disk directory 24, 25
Loading paper 15
Locomotive BASIC 2 18

M

Mains on/off switch 14
Mains plug 7
Maintenance 2
Manual paper feed knob 17
Margins 44
Microsoft BASIC 18
Mini typeface 34, 65
Moving the paper 16, 17
MS-DOS 23

N

NLQ-proportional typeface 36
NLQ-standard typeface 31, 35
Notation 22
NUL code 32

O

Off line 18
On line 17
On/off switch 14

P

Page length 45, 74
Paper feed knob 17
Paper feed rates 48
Paper guide bar 7, 20
Paper guides 15
Paper (loading) 15
Paper out 14, 61, 74
Paper thickness 16
Parallel interface 12, 73
PC 12, 13
PC-DOS 23
Perforation skip 45, 74

Pica typeface 33
PL-1 printer lead 13
PL-2 printer lead 12, 13
Power lamp 14
Preparation 8
Printable code area expansion 58
Print buffer 26, 43, 62
Printer cover 8, 9
Printer echo 24
Printer lead 12, 13
Printer legs 19, 20
Printer socket 72
Print formatting 21, 43
Print head stabilisers 8, 9
Printing 17, 18, 21
Print mode 65
Proportional attributes 67
Proportional typeface 35

Q

Quadruple density graphics 54

R

Reset printer 61
Reverse paper feed 50
Ribbon 7, 10
Right margin 45

S

Screen dump 25, 51
Self test printing 17
Servicing 2
Signal timing 75
Sinclair computer 1, 13
Single density graphics 54
Skip perforation 45, 74
Slashed zero 74

SOH code 32
Spain 30, 64
Specification 71
Standard typeface 34, 65
Subscript printing 36, 40
Superscript printing 37, 40
Sweden 30, 64
Switching on 14

T

Tab channels 48
Tabulation 46
Technical specification 71
Thickness of paper 16
Timing 75
Tractor feed paper 19, 45
Tractors 15, 19
Typefaces 31, 33, 42, 65, 74
Typewriter 57

U

UK 30, 64
Underlining 38
Uni-directional printing 56, 62
Unpacking 7
USA 29, 30, 64
User defined characters 66

V

Variable paper feed 49
Vertical tab 47

W

Wildcards 23, 25

Z

Zero slashing 74

P/N:802D0001-3250